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RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

CONTENTS FOR NOVEMBER, 1932

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therefore unequivocally shock-proof

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ROENTGEN DIAGNOSIS OF DISEASES AND ABNORMALITIES OF THE COLON[1]

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THE roentgen examination is undoubtedly the most useful method yet devised for the objective investigation of the colon. It should, however, be remembered that the colon study constitutes but one part of a complete examination of the digestive tract and that the ideal procedure is to study the entire alimentary canal as a unit by all available methods, no matter whether the symptoms suggest that the trouble lies in the colon or elsewhere in the digestive system. Furthermore, a proper study of the colon must be founded on sound physiologic principles, and, since the emptying time of the human large intestine is a matter of days rather than of hours, one must be prepared to devote an adequate amount of time to this work. It is always well to adopt a systematic order of procedure and to employ it routinely and conscientiously in all cases, unless one is prevented by special considerations from doing so.

TECHNIC

The modern technic of colon examination is based on the solid foundation prepared by such pioneers as Rieder, Holzknecht, Haenisch, Hurst, Schwarz, Stierlin, Carman, Mills, Case, and A. W. Fischer. Among individual roentgenologists, there is naturally much variation in the details and order of procedure. This variation depends not only on the special interests and skill of the operator, but also largely on the type of material studied, whether acute or chronic, medical or surgical, ambulatory or hospital, public or private.

Our technic, though undoubtedly far from ideal, is deemed best suited to the needs of the average private patient who complains of digestive disorder. It is believed that the procedure recommended will be found adequate not only for the detection of organic disease, but also for the recognition and study of the early pathologic physiology and anomalies of the colon.

Whenever possible, the colon study should constitute a part of a general gastrointestinal examination, the other elements of which should include: history, physical examination, X-ray study of the upper alimentary tract, and such additional tests as may be necessary. In roentgenographic examination of the colon, two chief forms of procedure are available, the opaque meal and the opaque enema. The latter gives information primarily of colonic form, the former of colonic function. Each method beautifully supplements the other and both are needed for a complete investigation. In most cases, it is best to begin the examina-

[1]Read before the Radiological Society of North America at the Seventeenth Annual Meeting, at St. Louis, Nov. 30–Dec. 4, 1931.

tion by filling the colon from above. The standard barium mixture is employed, the observation on the colon commencing five hours after the ingestion of the opaque substance. At this time, the normal stomach is empty and the head of the barium column should reach the cecocolon. When this observation is completed, the patient should be given precise instructions for the remainder of the colon examination. The first essential is that no cathartics, enemas, irrigations, or suppositories be used to produce an artificial bowel action. On the other hand, every spontaneous stool should be recorded by the patient and the total for the 24 hours reported at each observation. It is also important that the patient continue his regular occupation and follow his ordinary diet during the period of study, if possible. He should not be permitted to practise any arbitrary food restrictions, but should be encouraged to eat well of all ordinary foods, so that a proper degree of stimulus may be made available for spontaneous bowel action. It is a good plan to check up on the food intake by a record of daily weighings.

The examination is continued by making an observation every 24 hours after the ingestion of barium until the colon and rectum are entirely free of opaque material. It is good practice to record on each film the interval following the original meal and the total number of spontaneous stools passed by that time.

During the observation of the progress meal it is important to prevent the development of a hard rectal impaction. It is probably no exaggeration to say that failure to do so tends to discourage wider public acceptance of gastro-intestinal X-ray examinations. Although it is unlikely that the opaque meal can of itself initiate rectal impaction, it can certainly aggravate the condition when a tendency to dyschesia exists. Unfortunately, such a tendency is common as, in 844 cases in which the manner of colon emptying was carefully observed, it was encountered in over 18 per cent. Hence, the following recommendations may be of value. As soon as a suggestion of packing is noted, the well-lubricated gloved finger should be introduced into the rectum to determine the density of the barium-fecal mass. As a rule, the rectal contents do not pack down to any appreciable hardness until 48 hours after the meal. At this time, particularly if no spontaneous stool has occurred to justify further waiting, the impaction should be broken up with the finger and two small bulbfuls of oil should be injected and retained for 10 minutes. Then an enema of one and one-half quarts of physiologic salt solution should be administered and the patient permitted to move the bowels. This procedure may have to be repeated once or twice to relieve the condition.

After the colon is seen to be entirely empty of barium, whether spontaneously or in the manner just described, the so-called nine-hour observation is made.[2] The patient is required to take a second barium meal, exactly as the first, at 8 A.M. It is consumed at home and constitutes the entire breakfast. One hour after the stomach is known to be empty—*i.e.*, six hours after the barium meal, in normal cases—the patient takes his usual lunch. He reports to the laboratory at 5 P.M., when the nine-hour observation is made. This test, one of the most useful single procedures in the study of the colon, reveals the presence or absence of ileal stasis, the type of filling of the cecocolon, the presence or absence of colitis, and the position and mobility of the cecum and hepatic flexure. For the mobility determinations, films made in both prone and erect positions are necessary.

In short, the barium meal procedure is

[2]Naturally, the nine-hour observation may be carried out on the original barium meal if time is available and the condition of the patient permits so long an observation on the first day of the study.

particularly useful in studying the function of the colon in general and in identifying such special conditions as atony, spasticity, irritability, and the various forms of constipation. It is the best means of recognizing anomalies of the proximal large intestine. The method also gives information, but less complete, concerning organic diseases of the colon and anomalies affecting its distal portion.

On the day following the nine-hour observation, the opaque enema is administered. Preliminary preparation: at 7 A.M. the patient is directed to take two or three saline enemas in succession in order to clear the bowel and to remove all traces of barium. He breakfasts at about 8 A.M. and reports for examination at 9 or 10 o'clock. The enema proper is made up of one ordinary glassful of barium sulphate and three-quarters of a glassful of kaolin stirred up in one and one-half quarts (48 ounces) of water. If more bulk is needed, it is made up in the same proportion. The mixture, heated to 110 degrees Fahrenheit, is delivered from a two-quart enema can suspended 2 feet above the level of the fluoroscopic table. An 8-foot run of rubber tubing and a hard rubber rectal tip, 1.5 inches long, 3/16 inch bore, complete the outfit. The usual preliminary precautions—running fluid through the tubing system to expel air, and the introduction of the well-lubricated tube tip by sight rather than by touch—should not be forgotten. The warm fluid is now allowed to flow into the rectum under accurate fluoroscopic control. At the first sign of discomfort on the part of the patient the flow is stopped until the spasm passes. Physiologic delays may be expected at the pelvirectal, splenic, and hepatic flexures. The filling of the bowel proceeds in this interrupted manner until the cecum is reached. A film is then made and the patient is permitted to expel the enema. Note is made of the amount of fluid required to fill the colon, of the degree of pain experienced, and of the rate of flow. After the patient's bowels have moved, a second film is made to record the details of evacuation. It goes without saying that both fluoroscopy and radiography should be carried out on the same table.

Some observers (Haenisch, Bryant) prefer to follow the evacuation of the colon under fluoroscopic control in order to obtain a better idea of the physiology of bowel emptying. This can be readily done just after the colon is entirely filled by lowering the enema can, the tube being still in the rectum, and allowing the contents of the bowel to flow out by gravity as well as by muscular effort. Films may be taken at will during this procedure.

Following the opaque enema a contrast enema may be administered, a procedure developed by Fischer. It consists of injecting air into the colon on top of whatever residue of barium remains after the expulsion of the opaque enema. Details within the bowel lumen can be better demonstrated by this than by the usual opaque enema. The equipment required is of the simplest. The same type of tip and tubing is employed as is used for the opaque clysma. To this is fitted a bulb for the air injection. A bulb of the Politzer bag type has been found satisfactory. The air is injected, as was the fluid, under accurate fluoroscopic control and the filling is discontinued when the cecum is reached. Incidentally, I have been impressed by the great distensibility of the cecum with air as compared with fluid. Films are made in the prone and in the right and left lateral positions as needed.

Another advance in technic which permits of the discovery of early and small lesions is the compression method of Berg. The procedure is based on the principle of minimal filling of the lumen with opaque material and graded pressure from without, in order to bring out the mucosal relief with

the greatest possible wealth of detail. The observation is best made after the expulsion of the opaque enema with, or without, the addition of air injection. Chaoul has further refined this method by inventing a balloon belt compressor with which the degree of external pressure can be precisely regulated.

The enema study, and its various refinements, is the prime source of information of colonic form and structure. It is also the best method of studying organic disease, particularly neoplasms. Retrograde obstruction is, of course, well brought out, as is irritability, particularly in its more advanced stages. In general, the enema is especially valuable because of its speed, for it can be used in emergencies and for general orientation purposes.

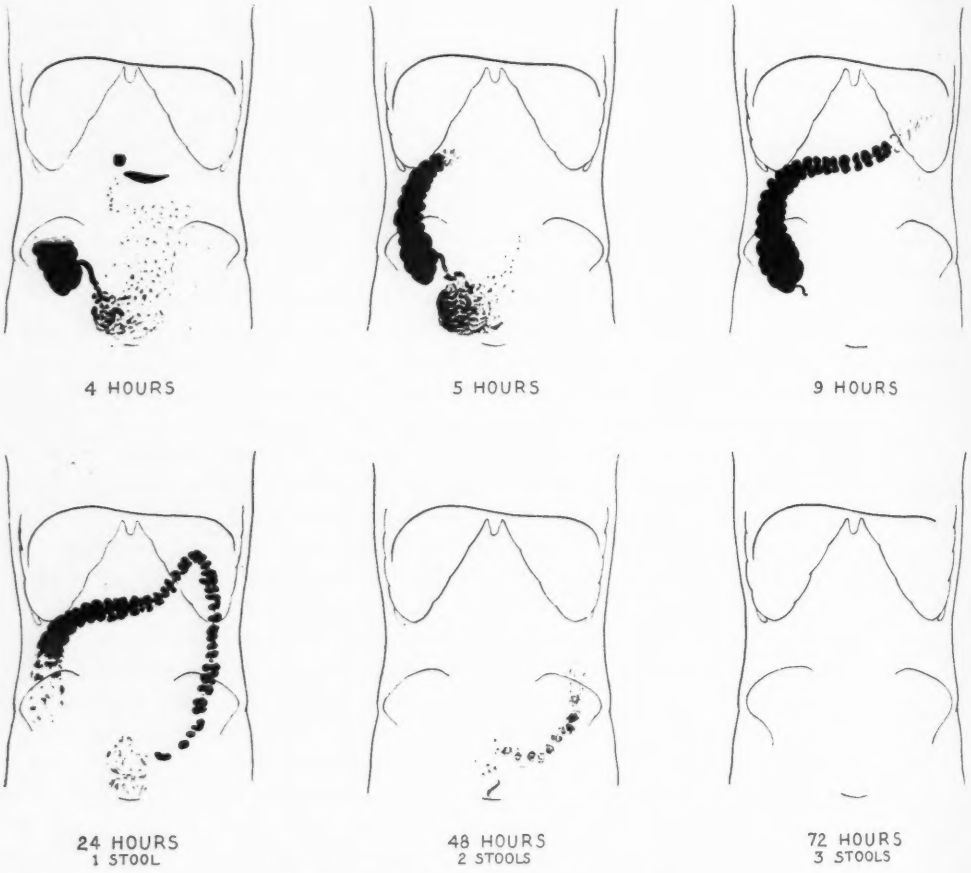

Fig. 1. Normal colonic filling and emptying.

THE NORMAL COLON

A knowledge of normal roentgen anatomy and physiology is essential. The colon begins at the cecum (caput coli), which normally lies in the middle of the right iliac fossa. The entrance of the ileum into the colon (ileocecal valve) marks the junction of the cecum and the ascending colon. Im-

mediately above this junction point is a narrowing, demonstrable in only a few individuals, which corresponds to a rudimentary cecocolic sphincter (Hirsch). The ascending colon ends at the hepatic flexure, which is located in a general way at the liver edge, but its precise position is sometimes difficult to define, especially in sthenic individuals. The transverse colon usually bends downward, at times into the pelvis, and in its distal portion follows closely the greater curvature of the stomach. The splenic flexure usually lies under and just within the tip of the spleen, but it may occasionally reach the left diaphragm. Rarely, it is on a lower level than the hepatic flexure. The descending colon terminates at the iliac crest. Here it joins the iliac colon, which traverses the iliac bone to continue as the pelvic colon when the brim of the pelvis is passed. The pelvic colon is the most variable part of the large intestine in length. Kinks occur most commonly in the iliac and pelvic portions. The pelvic colon joins the rectum in a sharp angle (pelvirectal junction) at the level of the midsacrum.

The haustral arrangement of the normal colon is distinctive. It is best seen after an opaque meal, when the haustrations are found to extend from the ascending colon to the rectum, being best marked in the transverse colon. In the usual roentgenogram, only two of the three rows of haustrations are visualized, the posterior being completely hidden by the upper row and the central axis of the colon. When normal, the haustra are evenly balanced and spaced, that is, the bowel lumen is central and the saccules on either side are approximately equal in size and symmetry. Ordinarily, the penetration between adjacent haustra is from one-half to two-thirds the diameter of the colon.

After a barium meal, the postural tone of the colon is well revealed graphically. Normally the proximal colon is wider than the distal in the proportion of about 3 to 2. The opaque enema is also adapted to this demonstration. The normal bowel requires an average of 38 ounces to fill to the cecum. The inflow, which is fairly uniform in rate, takes from two to four minutes for completion. There should be no pain, but, by the time the cecum is reached, a distinct call to defecation should be present.

The normal rates for the filling and emptying of the colon (Fig. 1) after a barium meal are, according to our experience:

At four hours the head of the barium column should reach the cecum.

At five hours the stomach should be empty and the head of the column should reach the vicinity of the hepatic flexure.

At nine hours the ileum should be empty and the head of the column should reach the vicinity of the splenic flexure.

At twenty-four hours the entire circuit of the colon should be completed, the bowels should have moved, usually with barium in the stool, and the cecum should begin to clear.

At forty-eight hours, the bowels should have moved again, this time with barium definitely in the stools, and the cecocolon (proximal colon) should be empty. Traces of barium may or may not persist in the distal colon and rectum.

At seventy-two hours, the bowels should have moved again and the colon and rectum should be entirely clear of barium.

ORGANIC DISEASES

Obstruction.—The particular method to be used for the diagnosis of colonic obstruction depends essentially on the acuteness of the process. Generally speaking, obstruction in the large bowel is a less severe menace than it is in the small intestine; hence, somewhat more deliberation is permissible in the examination. However, in the face of complete obstruction, no matter where it is located, speed is essential. Under such

circumstances, simple fluoroscopy without preparation may suffice to establish the site of the trouble. The bowel proximal to the point of stoppage is usually distended with gas, whereas, distal to this region, no shadow is visible. A "flat plate" should be made for more deliberate study. If time and the condition of the patient warrant, an opaque enema may be administered to confirm the findings, as well as to demonstrate a possible filling defect, should a neoplasm be present. Palpation during fluoroscopy helps to determine the relations of tenderness, bowel wall rigidity, and tumefaction in the obstructed area.

In incomplete occlusions a small barium meal may be administered to bring out the degree of obstruction or its effect on the proximal colon in the way of hypertrophy (increased peristalsis) and dilatation. It has been observed that the most distal point reached by the barium column may still fall short, by several inches or even a foot, of the actual location of the blockage. This phenomenon is explained by the presence of spasm or of non-opaque feces, in the region immediately proximal to the obstruction. Objection may be raised to the use of barium meals in any case in which obstruction is suspected. Although the danger associated with precipitating a complete stoppage is not so great in the colon as in the small gut, it is best to restrict the use of this method to cases in which adequate surgical skill is immediately available.

Tumors.—The filling defect, which is the characteristic manifestation in tumors of the colon, may be revealed by both opaque meal and opaque enema. The latter method is preferable, not only because of the dangers associated with obstruction, but because the filling of the colon is much more complete and more easily controlled when it is performed from below. In administering the clysma, an effort should be made to have some of the injection pass proximal to the neoplasm so that the full extent and configuration of the tumor may be visualized. When this effort fails with the opaque fluid alone, the double contrast enema, or the compression method, may succeed in producing some beautiful demonstrations. By means of the compression method, Berg has successfully studied the mucosal outline in tumors. In the contrast enema technic, the tumor mass itself is directly visualized much in the manner of a cancer of the fornix projecting into the stomach bubble (Figs. 2 and 3).

Sometimes it is difficult to decide whether a suspicious area is the site of a true filling defect or a severe spasm. In such cases, it is advantageous to repeat the examination, following the administration of belladonna to physiologic tolerance, or, as recently recommended by Holmes, during the inhalation of a few pearls of amyl nitrite.

When the tumor is not essentially obstructive, as in the case of a growth originating in the mucosa, but is spreading chiefly through the deeper layers, or on the peritoneal surface, the presence of a neoplasm may be overlooked entirely by methods now at our disposal. Until recently a similar failure frequently attended the demonstration of small polypoid masses. These were often entirely overshadowed by the mere bulk of the opaque injection. It is in just such cases that the new double contrast enema, to which Fischer and Weber have made noteworthy contributions, has proved so useful. It is possible that the contrast enema will help still further to distinguish between deformities in colonic outline due to intrinsic and extrinsic causes. I have recently found it of great help in deciding whether a large tumor was intra- or extracecal in location (Figs. 4 and 5).

Colitis Gravis.—In so-called idiopathic or ulcerative colitis, especially in the advanced stage, the bowel changes are well recorded

Fig. 2. Carcinoma of the cecum (operative control). Filling defect, shown by ordinary opaque enema. Same case as shown in Figure 3.

Fig. 3. Carcinoma of the cecum. Actual growth, visualized by double contrast enema. Same case as shown in Figure 2.

Fig. 4. Extra-colonic lymphosarcoma (operative control). Pseudo-filling defect of the cecum, shown by ordinary opaque enema. Same case as shown in Figure 5.

Fig. 5. Extra-colonic lymphosarcoma. Integrity of the cecum established by double contrast enema. Same case as shown in Figure 4.

by the opaque enema method. The affected portions of the colon are extremely irritable. There is a slight delay in filling and a great deal of haste in emptying. The colon is contracted either by spasm or by an actual shrinkage of the lumen, due to wall thickening and stricture formation. Often pockets of gas are caught between the spastic areas. The appearance of the diseased bowel has been likened to a tape or band, and, when spasm predominates, to a string of sausages. In the stage of pseudo-polyposis, a characteristic mottled appearance is presented by the barium column, the negative shadows representing the islets of intact mucosa between the deep and confluent ulcerations.

Although the barium meal changes are similar in character to those of simple colitis, they are far more severe in degree. There is much streaking, feathering, loss and distortion of haustrations, and disruption of the fecal column. Mass peristalsis is commonly observed in these cases.

Tuberculosis.—For the diagnosis of tuberculosis both the opaque meal and the opaque enema are useful. The meal reveals irritability and deformity in the proximal colon, which is the region (next to the terminal ileum) most commonly affected by the Koch bacillus. The most important single observation is that made nine hours after the administration of the barium. In a typical case of ulcerative cecal or cecocolic tuberculosis, the classic Stierlin phenomenon may be present. There is delayed emptying of the ileum, non-filling of the involved proximal colon, and rapid filling of the colon distal to the lesion. Not uncommonly the head of the barium column has reached the rectum, or one or more barium stools have been passed by this time.

The Stierlin phenomenon is not pathognomonic of tuberculosis of the cecocolon. It may be observed in tuberculous ulceration of the ileum in the presence of an intact colon, as well as in other diseases of the cecum or its neighborhood, such as amebic or ulcerative colitis, carcinoma, or even appendix abscess. Conversely the Stierlin phenomenon may be absent in proven cecal tuberculosis. Here the cecocolon may appear either quite normal in outline or else it may fill irregularly, with loss of typical contour and haustral configuration.

In hyperplastic tuberculosis, the contracted cecocolon appears as a narrow, centrally placed, fistulous tract outlined either by barium alone or by a mixture of barium and the intestinal gas so commonly present in this condition. A hard elongated tumor may be palpated in the involved area.

Examination of the tuberculous colon by the opaque enema reveals localized deformity, irritability, and spasm in the proximal colon. The simultaneous appearance of a filling defect in the cecum and of entry of barium into the terminal ileum, due to ileocecal insufficiency, constitutes, as Gershon-Cohen points out, an analogue of the Stierlin phenomenon. Fleischner and Gershon-Cohen have emphasized the advantages of the double contrast enema in the study of colonic tuberculosis. Deformities of the ileocecal valve and actual ulcerations of the mucous membrane may be brought to light by this method. In addition, a hyperplastic inflammation of the mucosa may be suspected from a mosaic appearance of the barium shadows, which is in marked contrast to the uniform coating in the unaffected distal colon.

Other Ulcerative Processes.—In dysenteries of other origins, the roentgen ray alone is at present unlikely to make a positive etiologic diagnosis. The early stages of all the organic colitides may be indistinguishable from simple colitis *(quod vide)*. Advanced cases may show findings similar to those described in colitis gravis or tuberculosis, according to the specific localization of the condition. *Amebic colitis* has been

studied, but not very extensively (Vallarino, Henderson). The cecocolon is most commonly involved. Irregularities in outline may be present but Henderson believes that this segment is much less irritable in amebic colitis than in tuberculosis.

Appendicitis.—In acute and perhaps in recurrent subacute appendicitis the diagnosis should be made clinically; the X-ray is really not needed.

Chronic appendicitis is a much disputed disease, the very existence of which is doubted by many competent observers. The roentgen criteria that have chiefly been used in diagnosing it are fixation and tenderness of the appendix vermiformis. However, these findings lose their special significance when it is realized that fixation may be due to congenital pericecal bands or membranes, and that tenderness may likewise be explained by causes other than inflammation, such as sensitiveness of the neighboring nerve plexuses. In a series of 286 individuals whose appendix had been removed, right lower quadrant tenderness persisted in 31 per cent, an incidence one and one-half times greater than that found in an unselected series of 1,639 cases in which right lower quadrant tenderness occurred in 320 cases, or 19 per cent. The clinical significance of barium stasis in the appendix is still questionable. Our experience is that appendiceal stasis is closely associated with cecal stasis. However, we were unable to find any causal relation between cecal stasis and appendiceal disease (Kantor, Schechter, and Marks).

The above data all point to the wisdom of making the diagnosis of chronic appendicitis circumspectly and only after all other causes for right lower quadrant symptomatology have been excluded. Indeed we have come to the conclusion that perhaps the chief value of the X-ray here lies in the correct appraisal of other possible sources of localized symptoms, such as low cecum, right-sided colitis, cecal stasis, calcified mesenteric glands, and ureteral stone. Tubo-ovarian disease and simple hernia are additional factors to be considered in the presence of right lower quadrant complaints, though they are not susceptible of roentgen demonstration.

RARE DISEASES AND CONDITIONS

Actinomycosis.—This disease resembles tuberculosis in its tendency to localize in the cecum, but differs from it by involving the outer walls of the bowel, rather than the mucosa. This characteristic naturally makes the roentgen diagnosis of actinomycosis a matter of difficulty. However, the tendency to fistula formation should be borne in mind as it may aid in the recognition of this disease.

Fistulæ.—These may be demonstrated either by enema or by the injection of an opaque substance from without. Perhaps the most common internal fistulæ are produced by carcinoma, whether it originates in the colon itself or in some adjacent viscus.

Non-specific Granuloma.—A rare form of non-specific hyperplastic inflammation of the colon may be suspected from the filling defect occasionally produced (Bargen, Goldfarb, and Sussman). However, a positive pathologic diagnosis is naturally beyond the reach of our present roentgen methods.

Morphine Hunger.—Ludlum and McDonald have studied the colon in morphine hunger.

Foreign Bodies.—If the foreign body is radiopaque, recognition is relatively easy, depending on its size and location. Foreign bodies originating within the alimentary tract, such as gallstones and fecaliths, are of special interest. These may be revealed even without the aid of an opaque substance. In some cases, the injection of air alone, or the use of a double contrast enema, is helpful

for the demonstration. A Bucky diaphragm is usually required for this work.

FUNCTIONAL DISORDERS

Constipation.—The diagnosis of constipation cannot always be made on the history alone. This point was investigated in 844 cases in which the emptying of the colon after the administration of an opaque meal was studied in detail. Agreement between the history and the roentgen findings was noted in only 68 per cent of the cases. In the remaining 32 per cent, the discrepancy took place in either direction; that is, in 20 per cent, the patient was constipated according to the history and not according to the roentgenograms, and in 12 per cent, the finding was reversed. It would thus appear that more people think they are constipated when they are not than the other way around.

Since the normal total colon emptying time was found to lie between 48 and 72 hours after the administration of the meal, constipation in the general sense may be diagnosed if barium is visible in either colon or rectum at the 72-hour observation. The sub-variety of constipation known as dyschesia (rectal stasis) may be diagnosed even earlier, usually at 48 hours. In order to complete the diagnosis, it is wise for the observer to satisfy himself by rectal palpation that the rectal shadow represents a true impaction, *i.e.*, that it is of such size and density that the patient cannot be expected to relieve himself spontaneously or without damage to his anal mucosa.

The cause of most of the varieties of constipation lies in the distal colon. Here the X-ray examination readily demonstrates the increased spasticity, the redundancies, and the kinks that may be at fault. For the demonstration of anatomic abnormalities (see below) the enema is the method of choice. Redundancy is found in 22 per cent of constipation cases, or one and one-half times its general incidence. The significance of kinks of the pelvic colon, particularly if this part of the bowel is prolapsed and adherent, has been emphasized by Case.

Nearly one-fifth of all patients show a tendency to rectal impaction. Soper has come to the conclusion that an obstinate form of rectal stasis is intimately associated with absence of a normal rectosigmoid apparatus.

Proximal colon stasis is of relatively little clinical importance unless it is associated with distal colon (ordinary) constipation and a low cecum. Owing to the complicated way in which retention may occur in this region, several subvarieties of proximal colon stasis have been described. In general, stasis may be diagnosed when barium is present in the cecum or cecocolon for 48 hours or more after the barium meal.

The Irritable Colon.—This condition, also called simple colitis, is revealed by characteristic alterations in the appearance and function of the colon. Hypermotility, probably the most important feature, is best demonstrated by the opaque meal. Irritable colon is said to be present when the head of the barium column has passed the splenic flexure at the five-hour observation, or reached the rectum with or without the passage of a barium stool at nine hours, or when the colon is entirely empty at 24 hours. Ileal stasis may be associated with the colonic hypermotility at the nine-hour observation. The haustra may be irregular, deformed, unbalanced, or entirely absent. In addition, the barium column may present a characteristic mottled, feathered, or stringy appearance. The latter is especially suggestive of mucus. In some cases the colon filling is quite interrupted, in others it may be marked by an excess of gas. These changes do not necessarily involve the whole extent of the large intestine, nor are they constant in appearance. It will be noted

that most of the significant roentgen criteria of colitis are available at the nine-hour observation, hence the importance of this test as a short-cut to diagnosis.

The opaque enema is also of value in the diagnosis of colonic irritability. Perhaps the chief feature brought out by this method is the diminished capacity of the colon. It can be directly measured in terms of ounces required to fill to the cecum, the normal being 38, as well as by the increased rapidity of inflow, the narrowed caliber, the unusual ironing-out of the haustra, and the increased pain during the administration of the clysma. In some cases, fine serrations may be superimposed on the normal haustral outlines. This so-called fibrillation (Mills) is especially likely to occur in early stages of diverticulosis (see below).

ANOMALIES

Anomalies of Length.—The redundant colon. The enema best reveals the bowel topography, but the progress meal is needed for a complete diagnosis of the pathologic physiology. The roentgen criteria of the redundant colon are:

In the typical case, the elongated pelvic loop must rise completely out of the false pelvis, *i.e.*, above the interiliac crest level seen in the prone film taken after the opaque enema. In the sub-variety known as "pelvic loop to the right," a portion of the elongated pelvic colon must lie in the right iliac fossa. Of course, redundancies of lesser magnitude may at times be clinically significant, but the rules just stated have been found most satisfactory for the classification and study of our own material. It is interesting to note that the average amount of enema fluid needed to fill this type of colon is 46 ounces, as compared with the normal 38 ounces. As much as 128 ounces was required in one of our cases. Associated displacement and distortion of the stomach from gas in the splenic flexure are not uncommon and are worth recording.

Anomalies of Rotation.—In non-rotation of the colon, the cecum is located in the left iliac fossa, the ileum enters from the right side, and the ascending colon may fail entirely to cross to the right of the midline. The splenic flexure and the distal colon in general remain in the normal position. This leaves the small intestine to fill the right half of the abdomen.

Anomalies of Descent. — Hyperdescent (low cecum) and hypodescent (high cecum) are both best visualized at the nine-hour observation. The opaque enema may be used for the demonstration of high cecum, but it is not so helpful in the case of low cecum, owing to the number of shadows super-imposed in the pelvis.

The roentgen criteria of cecal descent are:

The normal cecum comes to rest in the middle of the right iliac fossa. The low cecum reaches, or passes below, the level of a line joining the tops of the acetabular cavities as seen in the standard prone film. This implies that the caput coli passes at least half-way down into the true pelvis. Only prone observations are employed in making these measurements.

In complete non-descent, the cecum remains in the sub-hepatic position or, at any rate, does not pass below the level of the right iliac crest. However, since such cases are rare, it may be permissible, for certain study purposes, to diagnose a condition of "high cecum" when the tip of the cecum does not pass below the upper third of the ilium, measuring from the crest to the top of the acetabular cavity.

It is well to recall that occasionally the proximal transverse colon hangs down, festoon-like, in such fashion as to resemble a normal ascending segment, and covers the high-placed inverted cecal tip, which may even be attached to the liver. The true rela-

tions are visualized, as Jordan has pointed out, by radiography in the right oblique position.

Anomalies of Fixation.—These anomalies apply only to the right, or cecocolon. They are best studied at the nine-hour observation, when both prone and erect films are made. The crest of the ilium should always be centered at the middle of the film in order to insure comparable readings. The degree of mobility of the hepatic flexure and of the cecum may be separately estimated. A preliminary review of 259 cases showed an average hepatic flexure mobility of 1.76 inches and an average cecal mobility of 1.4 inch. The standards for normal, hyper-, and hypomobility of the right colon are now being studied.

Megacolon.—This anomaly is readily diagnosed by the opaque enema. Instead of filling to the cecum with the normal 38 ounces, the affected loop alone may hold much more than this amount (104 ounces in one instance). The differential diagnosis between Hirschsprung's disease and redundant colon is not difficult to make. In the former, the involved loop is tremendously dilated; in the latter, the loops are elongated with very little, if any, dilatation.

Diverticulosis. — Diverticulosis is here classed as an anomaly because predisposition to this condition seems to exist from birth. The diagnosis is made by both roentgen methods, which readily reveal the sacculations. The peripheral location of the circular shadows is characteristic. Spriggs and Marxer have described a saw-tooth appearance of the pelvic colon (also called serration, or fibrillation) as a prediverticular finding. Case emphasizes the associated displacement of the small intestine upward and to the right, especially if diverticulitis thickens the affected iliac and pelvic colon. It should be borne in mind that diverticula lend themselves admirably to demonstration by the double contrast enema and the mucosal relief methods.

When diverticulitis is superimposed on the underlying diverticulosis, spasm often occurs so severe as to cause more or less of a filling defect of the involved segment. In this case, especially if tumefaction is present, a differentiation from carcinoma may be very difficult. The use of antispasmodics, as recommended in the discussion of tumors, is indicated under such circumstances.

SUMMARY

1. The roentgen study of the colon is described. A technic suitable for the average private patient is presented in some detail.

2. Standards for normal colon function are given.

3. The special diagnosis of the most important organic diseases, functional disorders, and anomalies is presented.

BIBLIOGRAPHY

Note.—This brief list includes only the more recent publications. For an extensive bibliography, and especially for the earlier literature, reference should be made to Chaoul's standard monograph.

1. Bargen, J. A., and Jacobs, M. F.: Inflammatory Cecal Tumors; Diagnosis of Types of Obscure Etiology. Arch. Surg., May, 1930, XX, 832-850.
2. Berg, H. H.: Röntgenuntersuchungen am Innenrelief des Verdauungskanals: Ein Beitrag zur klinischen Röntgendiagnostik insbesondere von Entzündung, Geschwür, und Krebs. Georg Thieme, Leipzig, 1931.
3. Brown, L., and Sampson, H. L.: Intestinal Tuberculosis: Its Importance, Diagnosis and Treatment. A Study of the Secondary Ulcerative Type. Lea and Febiger, Philadelphia, 1930.
4. Bryant, J.: Ileal Regurgitation: Nerves and Diet in the Chronic Intestinal Invalid. Am. Jour. Med. Sci., 1920, CLX, 865.
5. Case, J. T.: Roentgen Observations Respecting the Causes and Treatment of Constipation. Bull. Battle Creek Sanitar. and Hosp. Clin., 1923, XIX, 26-48.
6. Idem: Diagnosis and Treatment of Colonic Diverticula. Am. Jour. Surg., June, 1928, IV, 573-596.
7. Idem: Fundamentals in Roentgenology of the Colon. Am. Jour. Surg., April, 1930, VIII, 844-858.
8. Chaoul, H.: Klinische Röntgendiagnostik des Verdauungskanals. Julius Springer, Berlin, 1928.

9. Fischer, A. W.: Ueber eine neue röntgenologische Untersuchungsmethode des Dickdarms; Kombination von Kontrasteinlauf und Luftaufblähung. Klin. Wchnschr., Aug. 20, 1923, II, 1595-1598.
10. Idem: Aufgaben und Erfolge der röntgenologischen Diagnostik bösartiger und entzündlicher Dickdarmgeschwülste. Ergebn. d. med. Strahlenforsch., 1925, I, 1-93.
11. Idem: Zur röntgenologischen Diagnose und Differentialdiagnose der Polyposis coli. Fortschr. a. d. Geb. d. Röntgenstr., 1926, XXXIV, 716-720.
12. Fleischner, F.: Die Darmtuberkulose im Röntgenbild. Ergebn. d. med. Strahlenforsch., 1928, III, 359-423.
13. Duval, P., and Roux, J.-Ch., and Béclère, H.: Radiologie Clinique du Tube digestif. II (Parts I and II): Esophage, Intestin, Foie, et Glandes annexes, by J. Gatellier, F. Moutier, and P. Porcher. Masson and Company, Paris, 1930.
14. Gershon-Cohen, J.: The Diagnosis of Early Ileocecal Tuberculosis; Preliminary Report with Special Reference to Double Contrast Enema. Am. Jour. Roentgenol. and Rad. Ther., October, 1930, XXIV, 367-388.
15. Goldfarb, S. J., and Sussman, M. L.: Chronic Hyperplastic Tuberculosis of the Colon. Am. Jour. Roentgenol. and Rad. Ther., March, 1931, XXV, 324-329.
16. Haenisch, F.: The Roentgen Examination of the Large Intestine. Arch. Roentg. Ray, 1912, XVII, 208-215.
17. Henderson, W. F.: Amebiasis of the Colon: Its Radiologic Aspects. Texas St. Jour. Med., September, 1931, XXVII, 363-366.
18. Hirsch, I. S.: The Cecocolic Sphincteric Tract. Med. Jour. and Rec., June 4, 1924, CXIX, 541-549.
19. Holmes, G. W., and Dresser, R.: The Use of Amyl Nitrite as an Anti-spasmodic in the Roentgen Examination of the Gastro-intestinal Tract. Am. Jour. Roentgenol. and Rad. Ther., January, 1928, XIX, 44-47.
20. Hurst, A. F.: Constipation and Allied Intestinal Disorders. Oxford University Press, London, 1919.
21. Jordan, A. C.: Chronic Intestinal Stasis. Oxford University Press, New York, 1923.
22. Kantor, J. L.: Colon Studies. IV. The Roentgen Diagnosis of Colitis (The Irritable Colon). Am. Jour. Roentgenol. and Rad. Ther., April, 1927, XVII, 405-416.
23. Kantor, J. L., Schechter, S., and Marks, J. A.: Colon Studies. VI, Cecal Stasis: Its Clinical Significance and Relation to Proximal Colon Stasis. Am. Jour. Roentgenol. and Rad. Ther., July, 1930, XXIV, 1-20.
24. Kantor, J. L.: Common Anomalies of the Duodenum and Colon: Their Practical Significance. Jour. Am. Med. Assn., Dec. 12, 1931, XCVII, 1785-1790.
25. Larimore, J. W.: Roentgenology of the Colon: Its Value in Clinical Medicine. Am. Jour. Roentgenol. and Rad. Ther., August, 1928, XX, 101-113.
26. Ludlum, S. D., and McDonald, E.: Morphine Hunger and the Smooth Muscle Reaction. Jour. Am. Med. Assn., 1926, LXXXVI, 835.
27. Mills, R. W.: Studies of Colon; Roentgen-ray Evidence of Colonic Secondary Changes. Am. Jour. Roentgenol. and Rad. Ther., June, 1924, XI, 487-503.
28. Moore, A. B.: Diseases Affecting the Distal Half of the Colon. Jour. Am. Med. Assn., Oct. 13, 1928, XCI, 1094-1097.
29. Soper, H. W.: The Rectosigmoid Apparatus. Am. Jour. Roentgenol., July, 1922, IX, 412-420.
30. Spriggs, E. I., and Marxer, O. A.: Multiple Diverticula of the Colon. Lancet, 1927, I, 1067-1074.
31. Vallarino, J. J.: Preliminary Report of the Value of the Roentgen Ray in Estimating the Extent of Amebic Infection of the Large Intestine. Am. Jour. Trop. Med., March, 1925, V, 149-156.
32. Weber, H. M.: Factors of Error in the Roentgenologic Diagnosis in Diseases of the Colon. Radiology, May, 1930, XIV, 460-467.
33. Idem: The Roentgenologic Demonstration of Polypoid Lesions and Polyposis of the Large Intestine. Am. Jour. Roentgenol. and Rad. Ther., May, 1931, XXV, 577-589.

DISCUSSION

Dr. L. R. Sante (St. Louis): Dr. Kantor's excellent work with the large bowel is familiar to all radiologists. The clue to his success was given in his first few paragraphs in which he designated and outlined the precision with which he goes about the examination. While his paper was so all-inclusive that it defies detailed discussion, it leaves one impression with us, namely, that it is deplorable in this day and age for the examination of the gastro-intestinal tract to be looked upon very much the same as other laboratory procedures, rather than as an intricate clinical study.

Every radiologist has been outwitted by an examination of the colon. Every man of any great experience has missed small lesions on one side or the other of the gut that were overshadowed by the bulk of the barium mixture. However, if we go about the examination of the colon with the care and precision that Dr. Kantor has outlined, our work will be much more precise and satisfactory.

ROENTGEN FINDINGS IN ALLERGIC INDIVIDUALS[1]

By C. H. HEACOCK, M.D., The Polyclinic, MEMPHIS, TENNESSEE

DURING the past three and one-half years roentgenologic examinations have been made of 368 allergic patients, selected from a group of 1,200, in the Department of Hay Fever and Asthma at The Polyclinic. The diagnoses, made by Dr. John P. Henry, were based on the histories, physical findings, and positive reactions to allergens applied by one or more of the methods of skin testing.

The number of examinations of the various regions was as follows:

Chest alone	51
Chest and sinuses	190
Sinuses alone	109
Gastro-intestinal tract	49
Colon alone	3
Miscellaneous	10

The final diagnoses, representing all the forms of allergy, are given in the tabulation below:

Asthma	119
Hay fever	103
Asthma and hay fever	94
Gastro-intestinal allergy	37
Others (mostly cutaneous forms)	15

Henry (4) points out certain facts which will aid us in an understanding of allergic conditions:

(a) Hay fever, asthma, certain dermatoses, and certain affections of the mucous membranes of the gastro-intestinal tract are similar in nature, differing only in the kind and location of the cells involved.

(b) The symptoms are the result of an altered reactivity of these cells.

(c) This altered reactivity is due to a sensitization of the cells to substances which are harmless to normal persons.

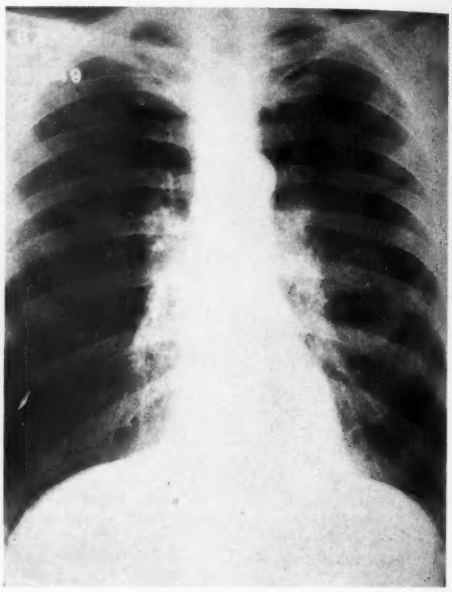

Fig. 1. Changes in the hila and peritruncal shadows in a patient with asthma and hay fever. The sinuses were not involved.

(d) Although the actual sensitization is acquired, the ability to become sensitive is, in the majority of cases, an hereditary characteristic.

Allergic symptoms may appear at any age. The oldest patient in this series was 73 years of age and the youngest was two weeks of age.

Sensitization is confined chiefly to mucous membranes, but the variations from normal are seldom visible roentgenologically except in the nasal accessory sinuses and bronchi. The changes in the bronchi are slight unless the allergy manifests itself as asthma. Of 40 patients with no asthmatic symptoms, inconspicuous changes were seen in the chest roentgenograms of 5; the remainder were entirely negative.

[1]Read before the Radiological Society of North America at the Seventeenth Annual Meeting, at St. Louis, Nov. 30–Dec. 4, 1931.

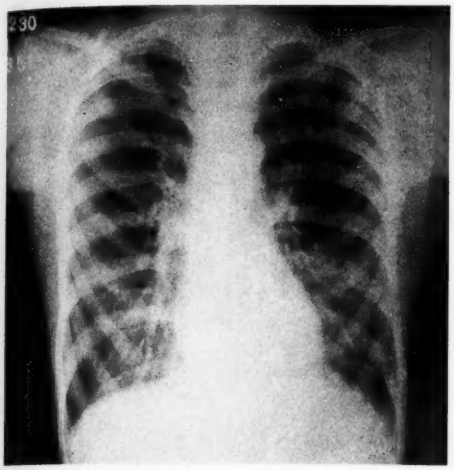

Fig. 2. Changes similar to those in Figure 1. Sinuses also were involved in this 11-year-old boy, who had suffered from asthma and hay fever for eight years.

CHEST

According to the classification of Manges (5), the variations from normal in 241 chest examinations of our series were as follows:

Peritruncal thickening	55
Chronic lower lobe infection	17
Hilar changes alone	54
Tuberculosis	29
No changes	86

It is difficult to determine whether allergy or infection is responsible for peritruncal thickening, chronic lower lobe infection, and changes in the hila. The pathologic processes in asthma are not clearly defined in the minds of pathologists themselves. Only a few necropsies have been performed. Steinberg and Figley (9) had the opportunity to make postmortem examinations in two cases of asthma. They distinguished between non-bacterial allergic asthma and bacterial asthma. In the non-bacterial type they found emphysema, partial or complete occlusion of the bronchioles with mucus, marked hypertrophy of the bronchial musculature, cellular exudation into both the lumen and walls of the bronchi, and hyperactivity of the glands. These changes, of themselves, are capable of producing all the exaggeration of the normal shadows usually seen in the roentgenograms of asthmatic patients. It can readily be understood why infection sooner or later may be superimposed upon such an altered membrane, followed by signs of chronic lower lobe infection, purulent bronchitis, and even bronchiectasis or bronchopneumonia. Four patients in this group presented the roentgenologic picture of bronchiectasis. The increase in size and density of the hilar shadows, either alone or accompanied by an increased width and density of the peritruncal shadows, was found consistently in all the patients with asthma, especially when the disease had persisted over several years. It is readily admitted that the roentgen appearance of the lungs in asthma is not pathognomonic. It cannot be distinguished from non-allergic bronchitis, sinus-bronchial disease, some forms of juvenile tuberculosis, changes due to influenza or excessive smoking, or passive congestion.

Sinus-bronchial disease is especially interesting in this connection, as it has been claimed that sinus infection is the cause of asthma. Although co-existent sinus disease may contribute to bronchial variations in asthma at times, it is not the prime factor. Sinus examinations of 21 of our patients were negative, yet definite hilar and peritruncal changes were present. The majority of the adults had undergone some type of sinus operation without relief, but had responded to specific allergic treatment. In these, however, too few follow-up examinations with the roentgen ray have been made to justify any conclusions regarding the disappearance of shadows. After studying 1,074 patients with asthma to determine the part played by focal infection, Rackemann and Toby (8) found that drainage of infected sinuses or removal of nasal polypi gave temporary relief in a large number of

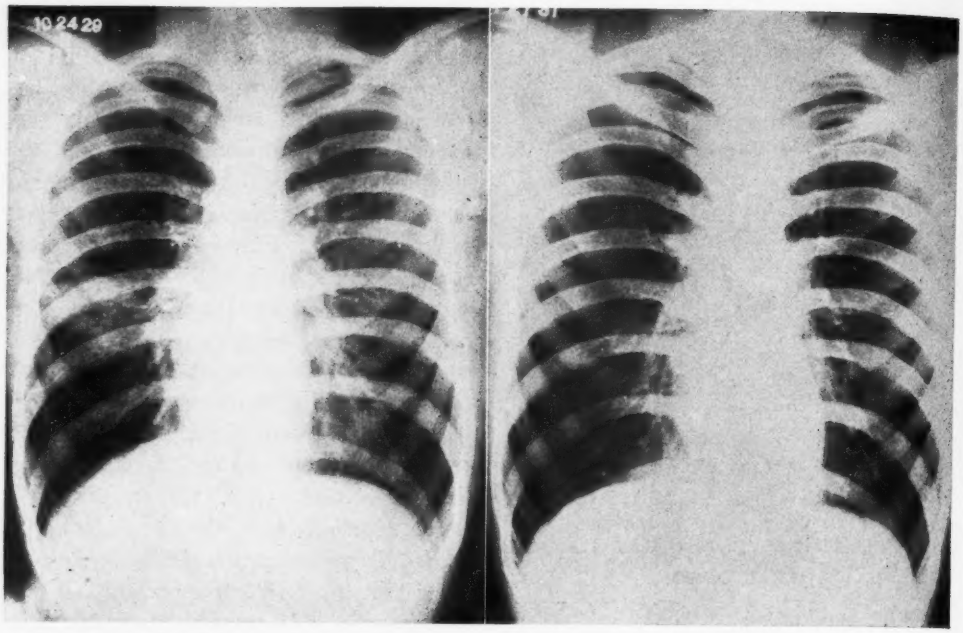

Fig. 3-*A*. Typical changes in hila and lower lobes of 17-year-old boy who had had asthma for ten years. The interlobar pleurisy on the right and the upper lobe changes are interpreted as tuberculosis.

Fig. 3-*B*. Same case as shown in Figure 2-*A*. Marked improvement after two years specific allergic treatment. Symptomatically well.

cases, but asthma was permanently eliminated in only 5 per cent.

Manges (5) has seen complete collapse of a lobe from occlusion of a bronchus in asthma. We have had no similar case, although one of our patients presented a small area of consolidation, unaccompanied by any of the signs or symptoms of pneumonia or abscess. The condition, which cleared up completely in a short time, was believed to be due to a small area of atelectasis secondary to occlusion.

One of the present cases was of special interest because of a transitory cellular emphysema. Asthma is often characterized by emphysema of the lungs, but in this case the route taken by the air to reach the tissues over the chest was open to conjecture. The case is being reported in detail by Dr. John P. Henry.

Evidence of pulmonary tuberculosis was found in 29 patients, or 12 per cent. This corresponds closely to the findings of 12 per cent in Manges' series of 354 patients, 18 per cent in Manges and Hawley's (6) group of 157, and 10 per cent in Harkavy and Hebald's (3) series of 400. From a study of our cases in the Department of Hay Fever and Asthma, we agree with Harkavy and Hebald that these patients react exactly as do those who are free from tuberculosis and that the tubercle bacillus itself is not responsible for the asthmatic attacks.

SINUSES

In allergic individuals, the mucous membranes of the nose and sinuses are most often affected. The majority of rhinologists believe that infection in the sinuses is the primary etiologic factor and that hay fever

or asthma cannot be cured until the sinuses are treated. On the other hand, it is the opinion of allergists that infection in the sinuses is secondary, and that allergic treatment should always precede surgery. As roentgenologists, we need not take sides in this controversy. We are in a position to render assistance to both rhinologists and allergists in determining whether the sinuses are involved, how many cells are affected, and, in a number of cases, the nature of the pathologic changes. Our method of examination offers a means of accurately checking the results, whatever the treatment employed.

Fig. 3-*C*. Sinuses of the patient whose chest is shown in Figures 3-*A* and 3-*B*. The sinuses never received local treatment. Two years between examinations.

Of the 368 patients in this group, the sinuses were radiographed in 299. Some variation from the normal was found in 214, or 71.6 per cent. The following tabulation shows to what extent the sinuses were affected.

Patients with changes in only one sinus	48
Patients with changes in two sinuses	68
Patients with changes in two or more, but not all	65
Patients with changes in all	33
Patients with changes in none	85
Total	299

The antra alone were affected in 85 patients, the largest number in which only one

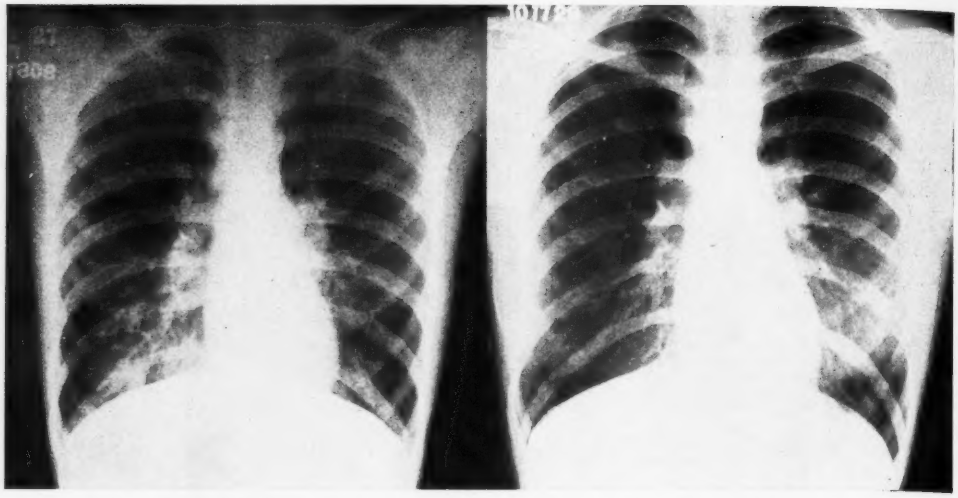

Fig. 4-*A*. Advanced changes, with lower lobe infection (bronchiectasis), in 13-year-old girl who had suffered from asthma for ten years.

Fig. 4-*B*. Same case as Figure 4-*A*, showing improvement following ten months of allergic treatment. Complete relief of symptoms.

set of sinuses was involved. The ethmoids alone were involved in six. In none were the changes limited entirely to the frontals or sphenoids.

Theoretically, allergic conditions are manifested in either of two ways: First, the membrane suddenly becomes edematous and congested, but subsides promptly after several treatments or removal of irritating allergens; or second, the membrane is more or less chronically congested, as in perennial hay fever and asthma. Proetz (7) cites a case which vividly illustrates that the membrane of a single antrum may vary greatly in thickness as the result of only one exposure to feathers. Weille (10) studied 160 specimens of tissue from the sinuses of 26 allergic patients and described the pathologic changes in the second, or chronic type. He found metaplasia of the epithelium and a thickening of the basement membrane. In two-thirds of the cases, edema or fibrosis of the tunica propria was also present. It is his opinion that the thickened membrane offers one chance in nine of harboring pus pockets and of thus becoming a focus of infection. Hansel (2) made similar investigations with the same result and the additional finding of polypi.

In the roentgenograms of our series of 299, nothing was found which would enable the roentgenologist to identify them immediately as being cases of asthma or hay fever. They presented the changes seen routinely in roentgenograms of pathologic sinuses, regardless of the etiology. The findings are given below, the cloudiness being graded on a basis of 4:

Cloudiness (two or less)	152
Cloudiness (three or more)	55
No general cloudiness, but polypi	13
Additional polypi found after lipiodol	3
Generalized hyperplasia after lipiodol	13

Subsequent roentgenologic examinations were made on but 4 patients following allergic treatment and all were improved.

GASTRO-INTESTINAL TRACT

Forty-nine patients of this series had an examination of the gastro-intestinal tract and in three the colon only was studied with

a barium enema. In the majority, a diagnosis of alimentary allergy was made, the offending agents being foods. Since allergy causes none of the organic lesions so readily detected by the roentgenologist, it is not surprising that 41 of these examinations were entirely negative except for occasional signs of reflex irritation in the stomach and colon. Organic lesions were found in the remaining eight gastro-intestinal cases and in the three in which an examination of the colon was made, as follows:

Duodenal ulcer	4
Gastric ulcer	1
Carcinoma of the stomach	1
Carcinoma of the sigmoid	1
Duodenal diverticulum	1
Tuberculosis of the cecum	2

It is interesting to note that one patient had previously had three negative gastro-intestinal examinations at other laboratories. Three patients had been unrelieved by removal of the gall bladder.

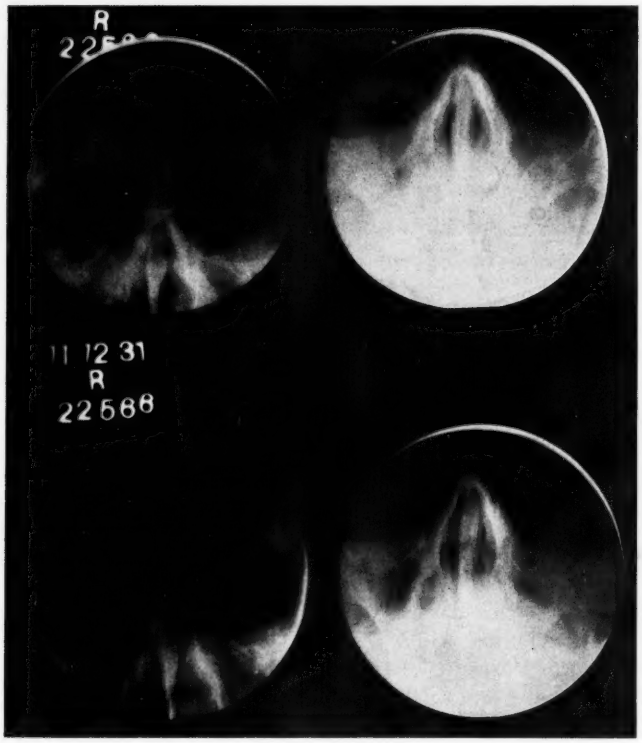

Fig. 5. Chronic suppurative pansinusitis superimposed upon an allergic membrane. Antra irrigated once and specific allergic treatment instituted. Complete symptomatic relief but incomplete resolution of the hypertrophied membrane. Fourteen months between examinations.

Ten of the 49 patients also had tetraiodophenolphthalein orally. The subsequent roentgenograms showed the following:

Gallstones	1
No cholecystogram	3
Normal cholecystogram	5
Normal filling but delayed emptying	1

COMMENT

Balyeat (1) claims that allergic individuals enjoy better than average health. It may be true that they have a stronger resistance to intercurrent infection, but from the study of these 368 patients, the incidence of tuberculosis, peptic ulcer, cancer of the gastro-intestinal tract, and cholecystic disease apparently is as high as in non-allergic persons.

The incidence of sinus affections in 71.6 per cent is certainly higher than is found in the average non-allergic patient. If we consider also those with allergic rhinitis and asthma, the percentage is increased to 78.5. Since it seems reasonable that hay fever and asthma produce a membrane extremely susceptible to bacterial invasion, the percentage of Weille's findings of pus pockets in one case in nine is probably too low. After the membrane has become involved, the signs of exudate, generalized hyperplasia, polypoid hyperplasia, and large localized polypi without general hyperplasia are present in the roentgenogram. We should remember Proetz' warning, however, that one roentgenogram of a thickened membrane does not justify operation, as well as Hansel's advice that non-suppurative or hyperplastic sinusitis should be regarded as an allergic sinus disease until proved otherwise.

Asthma, of itself, by virtue of the consequent thickening of the walls of the bronchioles, produces an exaggeration of the hilar and peritruncal shadows, especially of those in the lower lobes. The picture may be complicated when secondary infection has brought about purulent bronchitis or bronchiectasis. The typical roentgenogram of asthma is one with which we should be familiar, in spite of the fact that it may simulate that of other conditions.

The roentgenologic examination furnishes our most exact method of determining the extent of allergic processes. As a means of checking results of treatment, its value has not been fully appreciated. It deserves more extensive use.

BIBLIOGRAPHY

(1) Balyeat, R. M.: The Hereditary Factor in Allergic Diseases, with Special Reference to the General Health and Mental Activity of Allergic Patients. Am. Jour. Med. Sci., September, 1928, CLXXVI, 332-345.

(2) Hansel, F. K.: Clinical and Histopathologic Studies of the Nose and Sinuses in Allergy. Jour. Allerg., November, 1929, I, 43-70.

(3) Harkavy, J., and Hebald, S.: Bronchial Asthma and Pulmonary Tuberculosis. Am. Rev. Tuberc., May, 1930, XXI, 644-652.

(4) Henry, J. P.: Allergic Diseases, with Special Reference to Those Involving the Respiratory Tract. Read before the Mississippi State Medical Society, May, 1931. To be published later.

(5) Manges, W. F.: The Roentgen-ray Study of the Pathology of Asthma. Proc. Internat. Assemb. Inter-State Post-grad. Med. Assn., North America (1929), 1930, V, 48-52.

(6) Manges, W. F., and Hawley, S. J.: Roentgen-ray Observations in Asthma. Jour. Am. Med. Assn., Sept. 10, 1927, LXXXIX, 870-872.

(7) Proetz, A. W.: Sudden Allergic Reactions in the Maxillary Sinus. Jour. Allerg., May, 1930, I, 324-330.

(8) Rackemann, F. P., and Toby, H. G.: Studies in Asthma, IV: The Nose and Throat in Asthma. Arch. Otolaryngol., June, 1929, IX, 612-621.

(9) Steinberg, B., and Figley, K. D.: Pathology of Asthma; Non-bacterial Allergic and Bacterial Type Based on Autopsy Material. Jour. Lab. and Clin. Med., July, 1928, XIII, 921-942.

(10) Weille, F. L.: Studies in Asthma, XI: The Pathology of Allergic Tissue as Seen in the Nose and Accessory Sinuses. Arch. Otolaryngol., December, 1930, XII, 785-798.

DISCUSSION

Dr. A. W. Proetz (St. Louis, Mo.): My discussion must necessarily be from the laryngologist's standpoint. I hope that Dr. Heacock will elaborate that portion of his paper devoted to radiology of the sinuses, and publish it in a laryngologic journal. It is extremely important that the laryngologist should recognize the roentgenographic changes which occur in allergy, otherwise, he will continue to operate upon thickened membranes to the detriment of the patient. Our own observations have emphasized three points to which I wish especially to call your attention:

1. An otherwise normal membrane may

suddenly swell to ten times its normal thickness when an allergic individual is exposed to the allergen to which he is sensitive. The patient may not be skin-sensitive to this substance, and the skin tests may, therefore, be negative.

2. Some patients are sensitive to radiopaque oils or their components, and a swelling of 2 or 3 mm. may occur after the oils have remained in their sinuses for several hours. An estimation of membrane thickness with radiopaques is, therefore, reliable only in a film made shortly after filling (within an hour).

3. When the membrane is thin and quiescent, comparison of the bone margin shadow with the same shadow after the membrane is swollen indicates little, if any, change in the bone shadow. This leads one to believe that the contrast between bone-to-air surfaces and bone-to-membrane-or-fluid surfaces is not so great as has been supposed. Apparently something more than simply fluid contents is necessary to effect the sharp bone definition, as the bone shadow is quite sharp under the extremely thick sinus mucosa in allergic individuals.

DR. MERL L. PINDELL (Los Angeles, Calif.): Much has been written and said in regard to certain phases of allergy, but little has been written about chest findings in allergic individuals. Dr. L. W. Dean, in St. Louis, has done some splendid work relating to the sinuses.

I hesitate a little in accepting hila changes in the majority of allergic individuals. The roentgen appearance of the hila, and the territory adjacent to them, is a much disputed subject.

The essayist has shown a few slides of chests that could be considered bronchial pneumonia and tuberculous infiltrates. One slide, in particular, looked a great deal like a tuberculous consolidation in the apex of the middle lobe. I should like to ask Dr. Heacock if a Mantoux test was made on all these children.

DR. HEACOCK (closing): Dr. Proetz's experience has been very much the same as ours. I recognized the lantern slides as being those of the patient with an acute allergic attack, who was referred to in my paper.

The little boy about whom Dr. Pindell inquired did not have a Mantoux test. He had a negative von Pirquet, and there was no clinical suggestion of tuberculosis. No treatment was given for tuberculosis; the beneficial result shown on the film was accomplished entirely by specific allergic treatment.

PROGRESS IN RADIOLOGY DURING 1931: THE THORAX

By W. WALTER WASSON, M.D., DENVER

PART II, BEGINNING WITH TUMORS

TUMORS

THAT carcinoma of the lungs, bronchi, and mediastinum has been on the increase in the past few years seems to be the opinion of most of the writers on the subject. The year 1931 produced several excellent articles in which there appear compilations of personal data and reviews of the literature. There have been correlations concerning the age of incidence and the type of growth, the primary focus and type of spread (direct extension or metastasis), and the primary focus and potential metastases. Also there have been descriptions of symptoms, physical signs, roentgen findings and pathologic appearance, as well as considerations of the etiology and therapy. The general opinion seems to be that although primary carcinoma of the thoracic structures is rare, secondary growths are fairly common; and that the similarity of cancer and other chronic pulmonary diseases is so great that all diagnostic means must be employed to establish a positive diagnosis. As to therapy, combinations of radium, X-ray, and surgery seem most successful, although the prognosis for malignancies of the thorax is highly doubtful.

Primary Carcinoma of the Lungs and Bronchi.—Valuable data on primary carcinoma of the bronchus are compiled by Atkin,[1] who reports necropsies on 93 individuals, from which he draws conclusions as to age, incidence, frequency, metastases, and tendency. In Vinson's[2] report of 71 cases of primary carcinoma of the bronchus diagnosed by bronchoscopic examination, he expresses the belief that the condition is not a rare one. He obtained beneficial results from radiotherapy. Beutel and Woldrich[3] report an interesting case of primary bronchial carcinoma with a secondary anemia. The subject was a worker in the uranium mines of Joachimstal, and the condition was not diagnosed until the third interval examination, and then there was total stenosis of the bronchus. McCrae's[4] article deals with symptomatology, probable etiology, and treatment of bronchial neoplasms. He concludes that if the mortality from this disease is to be reduced, it must be by education of the profession, exact diagnosis, intelligent and proper therapy (preferably radium and X-ray), and team work. Soulas[5] advocates bronchoscopic diagnosis of bronchopulmonary cancer to follow and complete clinical and roentgen examinations. Pancoast and Pendergrass[6] report a new technic for radiation therapy of primary bronchogenic carcinoma of the lungs. They employ weak radon tubes (not over 1.5 mc.), and implant them in the growth under bronchoscopic guidance. The treatment seems advisable in growths of bronchogenic origin, preferably pedunculated, and those that have not invaded the bronchial wall to a great extent. Menne, Bisaillon, and Robertson[7] conclude from their pathologic and clinical study of 16 cases of primary bronchogenic cancer that there are two groups, hilar nodular and diffuse necrotic, and that "further pathologic classification is superfluous and unnecessary." They feel that symptoms, signs, and findings can be explained on the basis of pathologic changes. Davison and Horwitz[8] were interested in metastases from primary lung cancer to the central nervous system.

[1]Jour. Path. and Bact., May, 1931, XXXIV, 343.
[2]Minnesota Med., January, 1932, XV, 15.
[3]Ztschr. f. Kresbsforch., Aug. 14, 1931, XXXIV, 109.
[4]Arch. Otolaryngol., December, 1930, XII, 727.
[5]Bull. et mém. Soc. méd. d. hôp. de Paris, Nov. 2, 1931, XLVII, 1536.
[6]Am. Jour. Roentgenol. and Rad. Ther., March, 1932, XXVII, 357.
[7]Northwest Med., April, 1931, XXX, 155.
[8]Arch. Int. Med., October, 1930, 680.

They studied 12 cases, and conclude that the spinal cord is rarely the seat of metastasis from primary carcinoma of the lung, but for both diagnostic and therapeutic reasons, thorough examination and roentgenograms of the chest are advisable in every case in which tumor of the brain is suspected. Of their cases, 11 per cent showed involvement of the central nervous system. Doubrow's[9] observations in Germany and Czechoslovakia indicate that lung cancers of industrial origin are limited mostly to a few definite mining regions: a similar survey in France did not show the miners there to be affected by the disease. Häbler[10] found from his observations on 47 patients that pulmonary carcinoma is more common in males, but he could not corroborate the assumption that occupational injuries were a possible cause. He could not demonstrate a predisposing influence to coal dust, tobacco smoke, or gassing during the War. He does attach importance to the etiologic theories of *abnutzung* (wear and tear) and of carcinoma developing on the basis of congenital epithelial metaplasias. Edwards[11] discusses the symptomatology, diagnosis, and examination methods, including thoracotomy for exploration. He mentions 118 cases of primary malignant neoplasm although he cites only five specific ones. He favors X-ray, bronchoscopic, and thoracotomy examinations. For therapy, he prefers radium and X-ray, and feels that radon seeds offer the most encouragement. The degree of result is doubtful in his cases because only a short time has elapsed since the institution of treatment. Fremont-Smith, Lerman, and Rosahn[12] studied 18 cases of primary carcinoma of the lung, and they feel that after the age of fifty, the onset of cough, with pain in the chest, or hemoptysis, should suggest cancer of the lung rather than tuberculosis. They stress the point that symptoms of the greatest importance to the patient may be caused by metastases. Cathala and his associates[13] feel that their case serves as a warning to others to exert great care in interpreting even the most characteristic roentgen shadows. This is prompted by the fact that roentgenologically their case was a typical instance of hydatid cyst, with rupture into the bronchus. The diagnosis of ulcerated cancer was made clinically and confirmed at autopsy.

Tumors of the Pleura.—Of the five cases reported by Klemperer and Rabin,[14] four were giant tumors of the visceral pleura, and one was a diffuse neoplasm of the pleura. The giant tumors are of a low grade of malignancy, progress slowly, and caused death by interference with the circulation.

Thymus Tumors.—Several tumors of the thymus are reported, one of them by Craver,[15] whose knowledge of such conditions is best exemplified in an article in which he stresses the necessity for diagnosis, and the especial value of the roentgenogram. He also notes signs that are often overlooked or misinterpreted, namely, puffiness about the eyelids (in one case a peculiar pink discoloration of the eyelids) and fullness at the base of the neck; swelling of the veins on the chest wall usually in the upper part of the front, at the center, or spreading toward the shoulders; weakness; nervousness; loss of weight; vague pains in the chest; dyspnea; cough; enlargement of the lymph nodes above the clavicles; tumor over or beside the sternum; herpes zoster; abnormal dullness over the sternum; exophthalmos; tachycardia; bronchovesicular breath sounds; partial or complete obstruction of the esophagus. He feels that biopsy is of minor value, and may be dangerous.

[9]Paris méd., March 21, 1931, I, 287.
[10]Deutsche Ztschr. f. Chir., May 7, 1931, CCXXXI, 323.
[11]British Med. Jour., Jan. 24, 1931, I, 129.
[12]New England Jour. Med., Sept. 4, 1930, CCIII, 473.
[13]Bull. et mém. Soc. méd. d. hôp. de Paris, May 25, 1931, XLVII, 818.
[14]Arch. Path., March, 1931, XI, 385.
[15]Med. Clin. No. Am., September, 1930, XIV, 507.

The therapy is always irradiation. Metastases under strange guises are to be watched for.

Primary Carcinoma of the Trachea.—Figi's[16] report of five cases of primary carcinoma of the trachea, with the results of therapy, seems to be the only one on the subject. One of his cases had remained well over a year after treatment; the rest had died. He says the condition is one that is seldom recognized early, although there is a definite syndrome produced, namely, slight irritation or tickling sensation in the trachea especially on lying down, paroxysms of coughing with production of crusts or clots of blood, active hemorrhage, or persistent hoarseness, increasing dyspnea or stridor. Therapeutically, he advises destruction with surgical diathermy followed by exposure by tracheotomy, and then irradiation. Only those moderate early lesions which are situated in the upper half of the trachea offer possibility of cure. He believes that roentgenographic, bronchoscopic, and clinical examinations all aid in the diagnosis, but that biopsy must be used advisedly as it may prove dangerous.

Secondary Growths.—Among the reports of secondary pulmonary growths is the very valuable study by Kirklin and Ochsner[17] concerning roentgenographic observations of 206 proved cases of malignancy. The greatest incidence was from cancer of the breast. There was no involvement in one-eighth of these cases, but when it did occur, it was usually bilateral. If unilateral, the right side was the one more frequently involved. In more than one-third, accompanying pleuritic exudate was present; there was increased hilar infiltration in 39 per cent, and the frequency of the infiltrative lesions was almost as great as that of discrete nodules. The distinctive feature was pleural involvement. Malignant testicular tumors produced definite circumscribed pulmonary metastases, usually bilateral, and accompanied by hilar infiltration in 20 per cent. Carcinoma of the prostate produced bilateral, fairly well circumscribed pulmonary lesions, and carcinoma of the bladder gave rise to either unilateral or bilateral metastases. Epithelioma of the uterine cervix produced well circumscribed metastases which were often unilateral, although there was a greater likelihood of bilateral involvement. Pulmonary lesions secondary to cystadenoma of the ovary resembled peritoneal extension in that a pleuritic exudate was produced either unilaterally or bilaterally in all cases. Metastatic pulmonary involvement from carcinoma of the large bowel was relatively frequent, but from carcinoma of the stomach it was rare. The pulmonary metastases from cancer of the kidney were usually bilateral, well circumscribed, and might be accompanied by hilar or mediastinal thickening. There was nothing distinctive about the metastases from primary bone lesions. From melanoepithelioma and squamous-cell epithelioma they occurred more frequently than had been thought, and unilateral involvement predominated. Metastatic lesions from the former were well circumscribed and from the latter they were infiltrative. Carcinoma of the thyroid often spread by direct extension and was coincident with mediastinal and hilar thickening and accompanied by definite parenchymal lesions. Bagliani[18] reports 12 cases to illustrate the value of the roentgen diagnosis for unsuspected pulmonary metastases. He says that in his clinic, carcinoma of the breast and stomach were the most frequent sources of metastasis to the lungs. The secondary growths were of two forms: (1) generalized lymphangitis carcinomatosa, and (2) generalized nodular (malignant nodules throughout the lungs). The former are easily recognizable on the radiograph, run a rapid course, and do not

[16]Arch Otolaryng., October, 1930, XII, 446.
[17]Radiology, September, 1931, XVII, 435.
[18]Radiol. med., February, 1931, XVIII, 214.

react to deep therapy; the latter are more chronic, the location varies, and therapy may give slight improvement. These latter may be secondary to sarcoma, and, if so, they react to therapy promptly. The apices are seldom the seat of malignant nodules. Matz[19] found, from his statistical study of 319 malignant growths in ex-service men, that although the lungs were not a common primary site of cancer, metastatic involvement was frequent. His material is a compendium of information sent in by all the regional offices of the Veterans' Administration. The data indicate that the most satisfactory therapeutic results are obtained from the following methods or combinations in the order named: (1) radium, surgery, and roentgen irradiation; (2) X-ray; (3) surgery; (4) X-ray and radium, and (5) symptomatic therapy.

Therapy.—Meland,[20] writing on radiation therapy of carcinoma of the respiratory tract, stresses the prime importance of accuracy in diagnosis. Next, he advises biopsy of laryngeal and bronchial carcinomas to determine the type and to compute the amount of radiation necessary for eradication. And finally, he urges more frequent tracheotomy for palliation in advanced cases. Levin[21] makes his deductions from twenty-five years' experience with cancers of the breast. He feels that the success of therapy depends on the stage of the disease and the type of involvement: the latter he judges by clinical criteria, not histologic, because they are more practical. The chief characteristic of the article is that it is a practical, commonsense approach to the problem of radiotherapy and surgery in cancer of the breast. He feels that, at present, advanced carcinoma presents the most pressing therapeutic problem.

Mediastinal Tumors.—Hosoi and Stewart[22] analyzed and reported eight cases of different types of mediastinal tumor masses. They conclude that there is no single pathognomonic symptom or sign for a differential diagnosis; that metastasis to the central nervous system, which is common, may so dominate the symptomatology that a diagnosis of primary brain tumor is made; and that tuberculosis may be suspected in the very early stages because of the persistent cough due to bronchial irritation by the growing mass. For diagnosis, they depend on clinical observations correlated with the roentgen and laboratory data. The last may be obtained by examination of the sputum, pleural fluid, or tumor cells; examination of a specimen obtained by probatory puncture or through the bronchoscope, and from biopsy. Desjardins[23] admits the difficulty in diagnosing mediastinal tumors. He considers two types of growth, those which consist mostly of lymphatic cells and which respond rapidly to therapy, and those of other nature, such as carcinoma and sarcoma, except lymphosarcoma, which are more resistant. Davison[24] agrees with the belief that intrathoracic tumors, both benign and malignant, are more common now. He says that the benign tumors of the lungs and mediastinum often produce atelectasis and bronchiectasis by pressure. He remarks on the possibility of coexistence in one patient of (1) primary carcinoma and pulmonary tuberculosis, and (2) abscess and primary carcinoma. He urges surgery for accessible benign tumors, and says that early surgery is the only hope for primary malignant neoplasms within the chest, because in such conditions roentgen therapy is only palliative.

Tumors of the Wall of the Thorax.—Zinninger's[25] report of tumors of the wall of the thorax, adds 27 more cases to the

[19]Med. Bull. Vet. Admin., November, December, 1931, VII, 1010, 1128.
[20]Calif. and West. Med., March, 1931, XXXIV, 165.
[21]Jour. Am. Med. Assn., March 19, 1932, XCVIII, 977.
[22]Arch. Int. Med., February, 1931, XLVII, 230.
[23]Röntgenpraxis, July 15, 1931, III, 657.
[24]Arch. Surg., December, 1930, Part 2, XXI, 1393.
[25]Ann. Surg., December, 1930, XCII, 1043.

238 which he noted in the literature. He feels that early and radical surgical removal is the choice of treatment, although diagnosis is difficult before operation. He says that partial removal is unsatisfactory.

Lymphatic Tumors.—Roentgenotherapy of the lymphatic tumors seems to be valuable. Levin's[26] study of over five hundred cases of lymphoma malignum and lymphosarcoma discloses his belief that both conditions are malignant, that each is a different phase of the same entity, and that radiologic treatment must be of the involved areas and prophylactically of those into which it is likely to metastasize. Kirklin and Hefke[27] feel that roentgen examination of the thorax does not permit a precise diagnosis of Hodgkin's disease, lymphosarcoma, or leukemia, but that all of them must be considered as one group called either "lymphoblastoma" or "malignant lymphoma."

Rarities.—Among the cases of rare tumors reported is the one of Rosenbaum and Gasul[28] of primary sarcoma of the lungs in an infant; Kramer's[29] cases of adenoma of the bronchus, and Lemon's[30] group which includes (1) fibrosis and calcification; (2) hygroma; (3) lipoma; (4) fibroma; (5) myxoma (fibromyxosarcoma); (6) neurofibroma; (7) osteochondroma and chondroma, and (8) dermoid cyst and teratoma. Blumensaat's[31] case of hypertrophic pneumic osteo-arthropathy is unusual because it was the result of a large metastatic melanoblastoma in the lung with multiple skin metastases. After roentgenotherapy the growth disappeared and there was improvement of the periosteal changes, especially in the hands and feet.

Coccidioidal Granuloma.—Carter's[32] article on coccidioidal granuloma is the result of extensive bibliographic study. He offers a discussion of the features which confuse the diagnosis with tuberculosis and blastomycosis and other infectious granulomas. He says that the finding of the organism is positive for diagnosis, because the course and the roentgen appearance are so confusing.

[26] Jour. Am. Med. Assn., Feb. 7, 1931, XCVI, 421.
[27] Am. Jour. Roentgenol. and Rad. Ther., November, 1931, XXVI, 681.
[28] Arch. Pediat., January, 1931, XLVIII, 63.
[29] Ann. Otol., Rhin., and Laryng., 1930, XXXIX, 689.
[30] Med. Clin. No. Am., July, 1931, XV, 17.
[31] Röntgenpraxis, Feb. 1, 1931, III, 134.
[32] Am. Jour. Roentgenol. and Rad. Ther., June, 1931, XXV, 715.

TUMORS—ADDITIONAL BIBLIOGRAPHY

ALBOT, G., DECOURT, P., and SOULAS, A.: The Circumscribed Pulmonary Form of Malignant Lymphogranulomatosis: A Study of Permeability of the Bronchi. Bull. et mém. Soc. méd. d. hôp. de Paris, 1931, XLVII, 77.

D'ANTONA, L., and BUONOMINI, G.: Primary Cancer of the Thymus: Case. Riforma med., Nov. 17, 1930, XLVI, 1823.

ARENDT, J.: Chorionepithelioma in the Male. Fortschr. a. d. Geb. d. Röntgenstrahlen, June, 1931, XLIII, 728.

AUER, A.: A Rare Type of Lymphogranulomatosis of the Mediastinum: A Contribution to the Differential Diagnosis of Mediastinal Tumors. Röntgenpraxis, Sept. 1, 1931, III, 799.

BOSANQUET, W. C., and LLOYD, W. E.: Malignant Tumor of the Thymus Gland. Lancet, July 4, 1931, II, 6.

CANIGIANI, T.: Intrathoracic Neurofibromas and Their Differential Diagnosis. Röntgenpraxis, March, 1931, III, 214.

COLLETT, F. J., and BERTOIN, R.: Coexistence of Calcified Retrosternal Goiter and Carcinoma of the Esophagus. Lyon méd., Feb. 1, 1931, CXLVII, 133.

CRAVER, L. F.: Effect of Irradiation upon a Malignant Thymic Tumor. Ann. Surg., January, 1931, XCIII, 391.

FOGGIE, W. E., and TUDHOPE, G. R.: Secondary Carcinoma of the Lung with Inconspicuous Primary in the Gall Bladder. Edinburgh Med. Jour., November, 1930, XXXVII, 632.

GOLTZ, E. V.: Primary Carcinoma of the Lungs and Bronchi. Minnesota Med., September, 1930, XIII, 605.

GRECO, A. J., and KEHOE, E. J.: Cancer of the Lungs. Med. Bull. Vet. Admin., September, 1931, VII, 876.

HUGUENIN, R., and ALBOT, G.: Extrapleural Fibroma of the Posterior Mediastinum: Diagnostic Study. Bull. Assoc. franç. p. l'étude du cancer, May, 1931, XX, 330.

KEITH, D. Y.: Mediastinal Tumors. Kentucky Med. Jour., August, 1931, XXIX, 396.

KELLER, W. L., and CALLENDER, G. R.: Neurofibroma Arising on the Pericardial Pleura. Ann. Surg., October, 1930, XCII, 666.

KUCKUCK, W.: A Contribution to Lymphogranulomatosis of the Lungs. Röntgenpraxis, Jan. 15, 1931, III, 79.

LILIENTHAL, H.: Giant Sarcoma of the Pleura: A Report of Two Cases, with Remarks on Operative Exploration of the Thorax. Arch. Surg., 1930, XXI, 1379.

LITTLE, H. G., and HALL, H. M.: Thymoma: Case. West Virginia Med. Jour., November, 1930, XXVI, 673.

LÜSCHER, E., and SCARTAZZINI, H.: Diagnosis and Treatment of Lymphosarcomas of Upper Respiratory and Alimentary Passages. Schweiz. med. Wchnschr., Feb. 28, 1931, LXI, 193.

MANDLER, V.: The Roentgenologic Diagnosis of Intrathoracic Tumors. Röntgenpraxis, Feb. 15, 1931, III, 151.

MUMME, C.: Simultaneous Occurrence of Aortic Aneurysm and Bronchial Carcinoma. München. med. Wchnschr., Oct. 2, 1931, LXXVIII, 1704.

PEKELIS, E.: Primary Carcinoma of the Lung and Bronchi: Five Cases. Tumori, January-February, 1931, V, 33.

PENTECOST, R. S.: A Tumor of the Mediastinum. Canadian Med. Assn. Jour., March, 1931, XXIV, 452.

PESSAR, H. T.: Lung Cancer and Lung Tuberculosis. New York St. Med. Jour., April 1, 1931, XXI, 413.

PLAZY, GOURIOU, and GERMAIN: Nodular Pulmonary Cancer Secondary to Cancer of the Breast. Bull. et mém. Soc. méd. d. hôp. de Paris, June 22, 1931, XLVII, 1100.

PORTA, R.: Carcinoma of the Lung, with Multiple Cavities of the Bronchiectatic Type. Radiol. med., January, 1931, XVIII, 9.

RABINOVITSCH, A. M.: A Contribution to the Diagnosis of Thymomas. Fortschr. a. d. Geb. d. Röntgenstrahlen, January, 1931, XLIII, 71.

REEVES, R. J., and KASABACH, H. H.: Sarcoma of the Rib. Am. Jour. Roentgenol. and Rad. Ther., September, 1930, XXIV, 262.

DA RIN, C.: Bernard-Horner Syndrome during Evolution of Epithelioma of the Lung. Sem. med., July 9, 1931, II, 81.

RIST, E., and ROLLAND, J.: Anatomoclinical Study of Primary Cancer of the Lung. Ann. de méd., October, 1930, XXVIII, 231.

ROTHMAN, J.: Carcinoma of the Lungs. Med. Bull. Vet. Admin., November, 1931, VII, 1044.

ROWAN, A. A.: Intrathoracic Neoplasms. Canadian Med. Assn. Jour., October, 1931, XXV, 401.

SAUPE, E.: Pulmonary Manifestations of Lymphogranulomatosis. Klin. Wchnschr., 1930, II, 1495.

SERFATY, M., and MAROTOLLI, O. H.: Massive Pulmonary Sarcoma Secondary to an Osteosarcoma of the Rib in a Child Eight Years Old. Prensa méd. Argentina, July 30, 1931, XVIII, 259.

SERGENT, É., DURAND, H., KOURILSKY, R., and COUVE: Primary Abscess-like Cancer of the Lung. Bull. et mém. Soc. méd. d. hôp. de Paris, May 25, 1931, XLVII, 806.

WIENER, R.: A Rare Form of Lymphogranulomatosis in Childhood. Med. Klin., Nov. 6, 1931, XXVII, 1637.

WILCOX, H. B., and WOLLSTEIN, M.: Mediastinal Teratoma in an Infant. Am. Jour. Dis. Child., January, 1931, XLI, 89.

EFFUSIONS

Sagel and Rigler[33] studied mediastinal pleural effusion, and they conclude that it is not so infrequent as was formerly believed, but that it is often overlooked clinically because of difficulty in diagnosis. They describe the characteristic roentgen finding, a triangular shadow on either side of and continuous with the median shadow, and from which it cannot be separated regardless of position. Freedman[34] discusses both mediastinal and interlobar encapsulated effusions, giving the diagnostic criteria for each. "Interlobar effusions are characterized by sharply defined band or wedge-shaped or circular shadows in the region of the interlobar septa. In the presence of a pneumonia, the only roentgenologic sign of an interlobar effusion is the bulging of the interlobar fissure, seen in the lateral view. Mediastinal pleural effusions are represented as band, wedge-shaped, or triangular shadows parallel to the vertebral column or to the cardiac silhouette." He feels that bronchography is a valuable aid in the diagnosis of both types of effusions. For Bowen's[35] quantitative study of pleural effusions, he made postmortem chest roentgenograms of every deceased patient at Fitzsimons General Hospital. He checked the films against the autopsy findings, and endeavored to produce typical pleural effusions in the cadaver. The first procedure showed wide variation in demonstrating pleural effusions; in the second, no correspondence could be found between the films and the findings, and the third was not successful because the vital factors are necessary to produce the typical configuration. He believes that while small effusions cannot be accurately estimated by radiography, films of suspected cases made in the lateral decubitus position offer the best method of demonstrating them. He also concludes that the failure to find fairly large effusions (400 to 600 c.c.), in numerous cases, either by physical diagnosis or by the roentgen examination, is due to the distribution of the fluid, which varies in different cases according to the combination of physical factors present. Post[36] states that a roentgen study of pleural effusion depicts increase of fluid, amount of lung compression and displacement of surrounding organs, re-establishment of any subsequent pleural thickening, adhesions or calcareous infiltration. He stresses the importance of fluoroscopic examination, and of both lateral and postero-anterior roentgenograms. He says that the interlobar encysted effusion, corresponding to one of the normal fissure levels, is seen on the postero-anterior roentgenogram as a band-like shadow of increased density across the affected hemithorax, while the medial encysted effusion appears as an additional shadow of increased density overlying the normal inferior mediastinal and heart shadows. Bauke[37] feels that although even a small amount of fluid in the pleural cavity can be shown by roentgen means when it accumulates in the lowest point, there is difficulty in the roentgen demonstration of the exudate which extends in a thin layer throughout the whole pleural cavity.

PLEURITIS AND PLEURISY

Schall[38] says that the cause of interlobar pleuritis is usually tuberculosis or pneumonia, the diagnosis is difficult except by means of the roentgenogram, and the course

[33] Am. Jour. Roentgenol. and Rad. Ther., September, 1930, XXIV, 225.
[34] RADIOLOGY, January, 1931, XVI, 14.
[35] RADIOLOGY, September, 1931, XVII, 520.
[36] Jour. Am. Inst. Homeop., October, 1931, XVII, 862.
[37] Med. Klin., July, 1931, XXVIII, 1032.
[38] Kinderärtzl. Praxis, February, 1931, II, 54.

is mild except when interlobar empyema occurs. He thinks many cases are misdiagnosed as epituberculosis, tuberculous infiltration, or non-syphilitic thickening. He and Hoffman[39] found that in good chest roentgenograms, a very fine line, either straight or slightly curved, can be seen in the right mid-chest. It is the "hairline" which Hotz and Schönfeld also found. They think it represents the interlobar pleura, but not necessarily old or recent interlobar pleurisy, as the normal may also cast this shadow in certain cases.

PLEURAL CALCIFICATIONS

Velde and Schlopsnies[40] state that calcification of the pleura takes place by encrustation with calcium salts; that the condition represents the final outcome after an exudative pleuritis, empyema, or hemothorax, and that in the living, it can be diagnosed only by means of the roentgen examination (both fluoroscopic and roentgenographic). Lamarque and Betoullieres[41] believe that although radioscopically one cannot differentiate a plaque of slight calcification about which an advanced fibrous process exists, it may be done radiographically. They state that radiologically, the calcified processes are divided into three groups: (1) small isolated calcified spots, irregularly placed on the parietal pleura, of equal or greater density than the ribs, and usually accompanied by tracts; (2) calcified tracts in the form of non-homogeneous, branched, stalactite bands, irregular in diameter, of greater density than the ribs, and (3) calcareous shells which have a truly pathognomonic appearance. They compare the last to the skeleton of the cuttlefish, and describe a shell as made up of two curves opening one within and one without the thorax. The ends taper; the upper more sharply, and it extends as high as the third or fourth rib; the lower is blunted by the diaphragmatic shadow in the frontal view. The great axis of the shell is parallel to, behind, and a little inside of, the post-axillary line. Fluoroscopically, the opacity seems uniform, but roentgenographically, it appears as either finely granular or cloudy. The mass presents a thin, dense band at the periphery which, in the tangential projection, appears as a calcareous shell. It resembles a calcified hydatid cyst. They also state that bloody effusion seems to affect the mode of calcification. As long as the evolution is aseptic, the calcification, which is made not in the effusion but in the region immediately subpleural to it, is regular and homogeneous, but if there is infection, it becomes irregular. Lippman[42] describes three cases with small circumscribed areas of calcification in the pleura which remained stationary for years. He says they indicate only small, localized, harmless pleural scars, and are of little clinical significance. Hubrich's[43] patient showed an area of dense calcification in the roentgenogram made prior to a goiter operation. The author thought it must have been calcification of the pulmonary parenchyma resulting from an old injury which produced an hematoma and led to destruction and necrosis.

ACCESSORY LOBES

Gråberger's[44] contribution concerning triangular, basal, and mediastinal shadows is especially directed toward the signs which permit recognition of accessory lobes. He reviews the literature, and cites two cases of his own which showed basal, triangular shadows on the first roentgen examination, but which cleared later. A sharp line that resembled an interlobe remained as the lateral border of the previously diseased area. He cites three more cases which showed sharp lines in the inner portion of the right

[39] Röntgenpraxis, Nov. 1, 1930, II, 977.
[40] Röntgenpraxis, July 15, 1931, III, 634.
[41] Paris méd., Feb. 7, 1931, I, 129.
[42] Röntgenpraxis, Aug. 1, 1931, III, 680.
[43] Zentrbl. f. Chir., Jan. 2, 1932, LIX, 30.
[44] Acta radiol., 1931, XII, 240.

base running obliquely upward toward the hilum, like interlobar lines between the upper and middle lobes. He explains the tent-shaped diaphragmatic adhesions seen in the medial portion of the base as organized exudate in the grooves which separate an accessory lobe from the rest of the lower lobe. He says that unless an accessory lobe is infiltrated or atelectatic, it will not be visible on the left through the heart shadow, and he illustrates his point with two cases. The straight lateral border of the basal shadow differentiates an accessory lobe from an encapsulated, basal, paramediastinal exudate whose lateral border is usually concave. However, the lateral border is straight also in atelectasis of the whole lower left lobe or of the right middle lobe, but in such cases other roentgen signs suggest the diagnosis of atelectasis. Debré and Mignon[45] describe the roentgen appearance of the azygos lobe. They say that on the film one sees a very fine, very regular shadow line at the right apex which runs to the upper section of the right hilus. This line describes either a rather large or rather small arc and extends from about the second to the fifth rib posteriorly. According to its course one may differentiate various types. The line begins in the apex in the shape of a little triangle and ends at the hilus as a thick homogeneous shadow (tear or drop), which can be easily confused with a line shadow. Inside the line, the transparency of the lung may be considerably decreased, thus permitting confusion with specific affection. Jabotinsky[46] feels that the presence of the azygos lobe is not exceptional. He found it in three of 1,400 roentgenograms and in two of 600 patients he examined. Shannon[47] reports four additional cases of this anomaly, and Brown and Braverman,[48] one. The unusual feature of the case reported by the latter authors is that in the roentgenogram, instead of the inverted comma-like line along the area corresponding to the usual position of the azygos lobe, there was a uniformly dense shadow suggestive of consolidation, but which upon examination proved to be free of any abnormal changes. Loben's[49] observations on the azygos lobe are noteworthy because in one of his cases the condition was associated with tuberculosis, and in the other, he found the anomaly in both brother and sister. He feels that the latter indicates an occasional familial nature.

[45]Rev. franc. de pediat., 1931, VII, 143.
[46]Vestnik Rentgenol. i Radiol., 1930, VIII, 351.
[47]Can. Med. Assn. Jour., April, 1931, XXIV, 498.
[48]Radiology, September, 1931, XVII, 575.

DIAPHRAGM

The large number of cases reported warrants the conclusion that diaphragmatic hernia, eventration, and thoracic stomach are conditions whose recognition is becoming more common. Moore and Kirklin[50] summarize the progress in the roentgenologic diagnosis of diaphragmatic hernia, and report 90 cases seen in the Mayo Clinic since 1924. They believe the condition is not so rare as it was previously thought to be. They emphasize the lack of knowledge of the clinical significance of small hiatus hernias, and note the difficulty of differentiating eventration from diaphragmatic hernia. Diemer's[51] patient had two rare conditions—patulous esophageal pathway with gastric herniation, and massive atelectasis of the right middle lobe. There was no connection of the one with the other, and each was discovered rather accidentally.

PNEUMONIA

As a result of Kriegel's[52] review of 125 cases of croupous and influenzal pneumonia, he lists five types morphologically: (1) massive homogeneous dullness of the involved lobe, the shadow more or less clear-cut; (2) mottled density in the diseased area, with

[49]Fortschr. a. d. Geb. d. Röntgenstrahlen, February, 1931, XLII, 231.
[50]Jour. Am. Med. Assn., Dec. 27, 1930, XCV, 1966.
[51]Colorado Med., September, 1931, XXVIII, 414.
[52]Ztschr. f. klin. Med., May 18, 1931, CXVI, 815.

more or less thickening and fleck-like areas distributed throughout, and occasional confluent fleck-like areas; (3) tortuous areas, with fleck-like shadows of rather indefinite outline; (4) the lung changes not so marked, some thickening and widening of hilus shadows, and (5) marked thickening and widening of the hilus only. He says that Types 3, 4, and 5 are of resolving pneumonia, and that in Types 3 and 4 it is necessary to differentiate from tuberculosis.

CHYLOTHORAX

There are two reports on chylothorax. The case reported by Van Nuys[53] was proved by examination of the aspirated fluid. After a review of the literature, the author finds that his is the sixty-sixth case reported, and, therefore, he concludes that the condition is a rare one. He treated the patient by aspiration and high voltage X-ray, and at the time of reporting, the patient was doing well. Cohn[54] reports a case which was difficult to diagnose because of obstructive phenomena. The diagnosis was confused with Hodgkin's disease, and enlarged mediastinal lymph nodes obstructed the thoracic duct and were found at autopsy. However, the final diagnosis was chylothorax and chylous ascites.

AIR CYSTS

Congenital air cyst of the lung is a condition which seems to be rare and difficult to differentiate in the roentgenogram from pneumothorax. Parmelee and Apfelbach[55] found it possible to recognize their case because there was complete absence of the characteristic hilus stump of pneumothorax, and the air-filled space could be seen outlined by a definite line, the wall of the cyst. Hünerman and Sievers[56] report a case of congenital cystic malformation of the lungs of a 14-day-old girl, saying it is the sixth case in the literature and the fourth diagnosed during life. In the roentgenogram, which is the only method of diagnosis during life, the diseased side is bright and the heart and mediastinum are pushed to the sound side; the collapsed stump of the lung is the differential note between pneumothorax and cyst. Eloesser[57] reports six cases of congenital cystic disease, three of each lung; one additional possible case of the left lung, and one other case not of that condition. He says there are two types, the infantile and the adult. The roentgenogram of the infantile form is similar to that of spontaneous pneumothorax; it reveals a straight shadow corresponding to the interlobar fissure and running across the translucent chest. A solitary cyst may cast a round mediastinal shadow or appear as an air-containing cavity lying either in the mediastinum or in the pulmonary parenchyma. In the adult type, the X-ray shows a curious system of whorls occupying usually the lower part of the lung field. If the whole lung is affected, the appearance is of a contracted gray hemithorax with a deviated mediastinum. Lipiodol injection often aids in the diagnosis. Dethmers[58] reports a case of a woman, aged 35 years, who was sent to the hospital with a diagnosis of pulmonary tuberculosis. The roentgenograms showed the whole right upper lobe filled with irregularly distributed small circular shadows which were thought to be congenital cysts. Lipiodol injection confirmed the diagnosis.

DERMOID AND HYDATID CYSTS

A number of dermoid and hydatid cysts are reported because of unusual features. In the case of Lamarque and Chaptal,[59] the interesting features were that several teeth

[53]Calif. and West. Med., April, 1931, XXXIV, 269.
[54]Am. Jour. Surg., February, 1931, XI, 260.
[55]Am. Jour. Dis. Child., June, 1931, XLI, 1380.
[56]Ztschr. f. Kinderh., 1930, L, 451.
[57]Radiology, November, 1931, XVII, 912.
[58]Acta radiol., April 15, 1931, XII, 135.
[59]Jour. de radiol. et d'électrol., November, 1930, XIV, 592.

could be roentgenologically demonstrated within the shadow of the tumor mass, and the tumor had perforated into a bronchus and produced a fistula, with secondary infection. According to their figures, theirs is the 168th case published. A previously unpublished case of hydatid cyst was elicited in the discussion of Phillips'[60] report of 34 cases. Jones, of Richmond, Virginia, says he reported the case but never published it.

OTHER CYSTS

The hematic cyst of the pleura reported by Huguet and Zucoli[61] was calcified also. In Pinelli's[62] case of paramediastinal echinococcus disease there was nothing to suggest a cyst. After X-ray examination, the diagnosis was made by clinical and radiological means.

EDEMA

Coe and Otell[63] were fortunate in obtaining a roentgenogram of the chest of their patient during the edematous stage as well as a second on the following day when there was considerable improvement in the acute pulmonary edema. They note the splotchy appearance on the film, and remark that apparently certain groups of alveoli become filled with fluid, while the remaining ones, particularly those at the periphery, are air-containing.

EMPHYSEMA

Herms[64] studied 20 clinically proven cases of emphysema by comparison of the roentgen and spirographic records, and found that the roentgenogram is characterized by a pathologic contour of the thorax and abnormally bright lung fields. Previously this brightness had been explained as increased air content of the emphysematous lung or as tissue degeneration or pulmonary anemia. He found that the total capacity of the lungs is not increased in emphysema, but is more often diminished. Kyphosis is a contributory factor in the increased brightness of the sagittal diameter. The highly prominent vascular markings of the emphysematous lungs are traceable to a contrast effect. Stasis of the pulmonary arteries appears as a basal intensified or increased shadow. Etiologically, the formation of definitely outlined lung markings is probably due to sclerosis of the pulmonary arteries.

ESOPHAGUS

An increasing amount of attention is being paid to varices and diverticula of the esophagus. Hjelm's[65] two cases of varices of the esophagus, diagnosed roentgenologically, prompt him to urge examination for these conditions in cases of hemorrhage from the digestive tract when the roentgen examinations of stomach and duodenum give negative results. He says remnants of a spoonful of contrast emulsion will lodge in grooves between the varices and they can be seen projecting into the lumen of the esophagus. If they are large and numerous, the fissure-like lumen of the empty esophagus, visible after the passage of the contrast medium, will be broader than normal. Pohlandt[66] says that the roentgen differential diagnosis between cancer and varicosities of the esophagus may be difficult because multiple small filling defects may be present in both. He says the only differentiation of importance is the slight narrowing and fixation of a cancer as compared with varicosities. Absence of normal elasticity and involvement of only a small portion of the esophagus are points which tend to indicate a malignant growth. MacMillan[67] reports that pharyngeal pouches were the cause of about 2 per cent and

[60]Arch. Surg., December, 1930, XXI, 1324.
[61]Bull. et mém. Soc. de radiol. méd. de France, December, 1930, XVIII, 464.
[62]Arch. di radiol., May-June, 1931, VII, 570.
[63]Am. Jour. Roentgenol. and Rad. Ther., January, 1932, XXVII, 101.
[64]Bietr. z. Klin. d. Tuberk., April 18, 1931, LXXVII, 251.
[65]Acta radiol., April 15, 1931, XII, 146.
[66]Röntgenpraxis, Oct. 1, 1931, III, 889.
[67]Jour. Am. Med. Assn., March 19, 1932, XCVIII, 964.

esophageal pouches of less than 1 per cent of 1,000 cases of dysphagia which he reviews. The roentgenograms of Benassi's[68] two cases of essential permanent esophagospasm in children showed a peculiar appearance caused by the projection of the mucous membrane contracted by the spasm. It was similar to the projection of the pyloric mucous membrane at the base of the duodenum, as described by Busi.

FOREIGN BODIES

Among the various foreign bodies reported are the usual number of safety pins, coins, and teeth. There was also a fountain-pen cap which was not opaque to the X-ray, and a piece of pork bone which could not be demonstrated on the film. McWhorter[69] calls attention to vegetable foreign bodies in the lungs as a source of severe laryngo-tracheo-bronchitis, if retained longer than a few hours. He reports six cases in which the various bodies were grains of corn, a piece of apple, and watermelon seeds. (Geography is evidently important, also!) There was one fatality, the rest making good recoveries.

PLEURAL MOUSE

Morlock and Wooh[70] report three cases of fibrin bodies in pneumothorax cavities, a condition which they term "pleural mouse."

SYPHILIS

McIntyre's[71] article on pulmonary syphilis is an excellent compendium of the material on that subject. He states that the only points of differentiation are possibly the radiating fanlike lines seen in the X-ray films, and the location, which is usually in the lower lobe more especially on the right. Hammer[72] also says recognition is difficult, but he adds that there is some diagnostic value in localization in the mid-portion of the chest or in an absence of calcification. He reports two cases with the clinical histories, roentgenograms, and autopsy findings. Bergerhoff[73] feels that the roentgenogram is a great diagnostic aid in differentiating interstitial pulmonary syphilis. He reports three patients in whom anti-syphilitic treatment produced disappearance of the changes. He contends that such pulmonary changes are commoner than hitherto supposed. Herman[74] feels that syphilis of the lungs is a rare disease and easy to mistake for other chronic pulmonary diseases, but that the roentgen appearance alone is diagnostic, and the Wassermann examination and specific therapy assist.

ABSCESSES

Fifty-five cases of amebic, hepatic, subphrenic, and pulmonary abscesses are reported. Sweany, Stadnichenko, and Henrichsen[75] report a case of multiple pulmonary abscesses caused by the Friedlander bacillus. The case is unusual because the bacillus grew better anaërobically than aërobically. Excepting the general appearance of the patient, the irregularity in temperature, and the obscure physical observations, clinically and roentgenologically, the condition resembled chronic pulmonary tuberculosis.

BRONCHIAL SPIROCHETOSIS

Mease[76] reports two cases of bronchial spirochetosis, and Talia[77] describes two cases with cavitation. The former urges correct dental hygiene to lessen the danger of lung infection. The latter made systematic radiographic observations for three or four

[68] Radiol. med., November, 1930, XVII, 1334.
[69] South Carolina Med. Assn. Jour., November, 1930, XXVI, 284.
[70] British Jour. Radiol., November, 1930, III, 515.
[71] Arch. Path., February, 1931, XI, 258.
[72] Röntgenpraxis, April 1, 1931, III, 301.
[73] Fortschr. a. d. Geb. d. Röntgenstrahlen, December, 1930, XLII, 478.
[74] Röntgenpraxis, Oct. 15, 1930, II, 916.
[75] Arch. Int. Med., April, 1931, XLVII, 565.
[76] Florida Med. Assn. Jour., February, 1931, XVII, 373.
[77] Radiol. med., December, 1930, XII, 1370.

weeks, and concludes that the cure is extremely slow, the radiologic characteristics are very like those of pulmonary abscesses, the reparation takes place centripetally, and radiologic examination aids in the diagnosis but biologic examination is necessary.

GOITER

Curtis[78] reviews the literature, and discusses 91 cases of intrathoracic goiter, 25 seen in Billings Hospital, Chicago, and 66 from Berne. He says the roentgen examination of the trachea is the conclusive diagnostic means.

TULAREMIA

Sante's[79] report of a case of tularemia is most valuable for the description of the pulmonary picture of this disease. In the lower portion of the right lung, he found an irregular area of consolidation, about 2.5 by 4 cm., which resembled the peribronchial infiltration seen in bronchopneumonia. There were tiny rarefied areas within the consolidation which may have been due to small abscess formation. There was no evidence of pathology elsewhere in either lung, and the heart and aorta appeared normal. Later, there was complete disappearance of the consolidation and a return to the normal, as well as uneventful recovery.

PERTUSSIS

Popischill and Feyrter,[80] of Vienna, made histologic examinations of 100 cases of pertussis, and they were able to show characteristic lesions, the nucleus of which was a peribronchitis. Radiologic examinations by Corcan, of Strasburg, confirmed their observations. He found roentgenologic evidence of constant changes, characterized by tracheobronchial adenopathy and by peribronchial shadows that descend along the hila toward the diaphragm. In grave cases, these produce a triangular image with its base on the diaphragm. The typical lesions of the disease which are revealed on the roentgenogram persist a long time after the paroxysms of coughing have ceased.

MAMMARY GLAND

Warren[81] believes roentgen examination of the mammary gland is of definite diagnostic value, and he describes his technic and tabulates his results. Seabold[82] agrees with him, but he urges the need for comparative knowledge of the normal breast under various conditions.

STERNUM

Löw-Beer[83] says that the roentgen demonstration of the sternum is somewhat difficult as it must be projected away from the shadow of the spine and the mediastinum, and that both neoplastic and inflammatory processes may produce destruction. In his six cases, four were from tumors, either benign or malignant; one was from syphilis, and one, from chronic osteomyelitis. In the last two, the changes were localized in the manubrium.

ADDITIONAL BIBLIOGRAPHY

Differential Diagnosis

BELOT, J., and PEUTEUIL, G.: The Rounded Opacities of the Thorax. Jour. de radiol. et d'électrol., October, 1930, XIV, 529.

BORELIUS, R.: Pneumothorax for Diagnosis of Caverns. Hygiea, Sept. 15, 1931, XCIII, 661.

COHEN, M. B., and RUDOLPH, J. A.: Allergic and Infectious Conditions of the Upper Respiratory Tract in Children. Jour. Am. Med. Assn., Oct. 3, 1921, XCVII, 980.

[78] Jour. Am. Med. Assn., March 7, 1931, XXVI, 737.
[79] Am. Jour. Roentgenol. and Rad. Ther., February, 1931, XXV, 241.
[80] Jour. Am. Med. Assn., March 7, 1931, XCVI, 787.
[81] Am. Jour. Roentgenol. and Rad. Ther., August, 1930, XXIV, 113.
[82] Surg., Gynec. and Obst., October, 1931, LI.I, 461.
[83] Röntgenpraxis, Sept. 15, 1931, III, 817.

FARRELL, J. T., JR.: Roentgenographic Appearance of the Thorax after Rib Resection for Pulmonary Abscess. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1939.

FLEISCHNER, F.: The Borderline between the Normal and the Pathologic in the Chest Roentgenogram. Röntgenpraxis, Oct. 15, 1931, III, 913.

HUDSON, W. A.: Lung Abscess. RADIOLOGY, January, 1932, XVIII, 1.

MORGAN, H. J.: Subacute and Chronic Pulmonary Infections Commonly Mistaken for Pulmonary Tuberculosis. Am. Rev. Tuberc., November, 1930, XXII, 491.

MYERS, J. A., and KERNKAMP, L. M.: Differential Diagnosis of Thoracic Diseases. Minnesota Med., April, 1931, XIV, 301.

NONNENBRUCH, W.: The Limits between the Normal and the Pathologic in the Lung Roentgenogram. Röntgenpraxis, Jan. 1, 1931, III, 1.

Value of Roentgen Diagnosis of the Chest

COLE, H. H.: Roentgenology in Diagnosis of Pathology. Illinois Med. Jour., September, 1931, LX, 260.

HOLMES, G. W.: Some Observations on the Use of Roentgen Ray in the Diagnosis of Surgical Diseases of the Chest. New England Jour. Med., Sept. 24, 1931, CCV, 607.

Proceedings of the Royal Society of Medicine, Section of Radiology: X-ray Diagnosis of Diseases of the Chest. British Med. Jour., Nov. 28, 1931, II, 990.

SHIPLEY, A. M.: Suppurations in the Chest. Delaware St. Med. Jour., January, 1931, III, 1.

SINGER, J. J.: Some Important Phases of Roentgenographic Diagnosis in Chest Diseases. Arch. Phys. Ther., September, 1931, XII, 526.

ZEINERT, O. B.: Wounds and Injuries of Thorax: Diagnosis and Management of Injuries to the Chest. Jour. Missouri Med. Assn., September, 1931, XXVIII, 414.

Limitations

KREMSER, C.: Possibilities of Error in Roentgen Diagnosis Especially of Diseases of the Lungs and Pleura. Beitr. z. Klin. d. Tuberk., Nov. 22, 1930, LXXVI, 79.

LACHMANN, E.: The Limitations of the Roentgenologic Diagnosis of Diseases of the Thorax. Röntgenpraxis, Sept. 1, 1930, II, 769.

Diagnostic Aids

COLE, L. G., *et al.*: The Site of Predilection in Cross-infection from the Right to the Left Lung. RADIOLOGY, December, 1930, XV, 627.

FAULKNER, W. B., JR.: Diagnostic Pneumothorax: A Guide in the Localization, Treatment, and Prognosis of Pulmonary Abscesses. Am. Jour. Surg., December, 1931, XIV, 646.

HART, A. L.: The Post-pneumonic Lung: A Critical Review. Am. Jour. Roentgenol. and Rad. Ther., September, 1931, XXVI, 371.

POLLOCK, W. C.: Mediastinal Displacement in Pneumothorax. Ann. Int. Med., October, 1931, V, 486.

POMPLUN, F.: Value of Roentgenology and Thoracoscopy for Indications for Thoracocauterization. Beitr. z. Klin. d. Tuberk., July 6, 1931, LXXVII, 656.

Cysts

ARIF, C.: A Case of Calcified Hydatid Cyst of the Inferior Lobe of the Left Lung. Jour. de radiol. et d'électrol., September, 1930, XIV, 506.

DREVON: Hydatid Cyst of the Lung. Bull. et mém. Soc. de radiol. méd. de France, December, 1930, XVIII, 478.

HABLISTON, C. C.: Hernia of the Mediastinum. Am. Rev. Tuberc., December, 1930, XXII, 702.

HILLEMAND, P., CHÊNE, P., and SOULÉ, F.: A Case of Pyopneumothorax Secondary to Hydatid Cyst of the Lung. Presse méd., Nov. 29, 1930, XXXVIII, 1626.

PICOT: Hydatid Cyst of the Lung. Bull. et mém. Soc. de radiol. méd. de France, April, 1931, XIX, 171.

SMITH, R. E.: A Case of Mediastinal Dermoid Cyst in an Infant. Guy's Hosp. Report, October, 1930, LXXX, 466.

Diaphragm

ALLING, E. E.: Traumatic Rupture of Diaphragm: Case Report. Mil. Surgeon, February, 1931, LXVIII, 211.

BIANCHINI, A.: Diaphragmatic Hernia. Radiol. med., October, 1930, XVII, 1127.

GEYMAN, M. J.: Right Diaphragmatic Hernia. RADIOLOGY, April, 1931, XVI, 483.

GIUSTINIAN, V., and ESTIER, M.: Congenital Diaphragmatic Hernia in an Infant. Sem. med., 1931, XXXVIII, 35.

JENKINSON, E. L.: Absence of Half of the Diaphragm. Am. Jour. Roentgenol. and Rad. Ther., December, 1931, XXVI, 899.

KROST, G. N.: Diaphragmatic Hernia. Am. Jour. Dis. Child., November, 1931, XLII, 1268.

LAFIELD, W. A.: Hernia through Esophageal Opening of the Diaphragm: Case of Right-sided Hernia. Yale Jour. Biol. and Med., December, 1930, III, 165.

MORISON, J. M. W.: Diaphragmatic Hernia. Proc. Roy. Soc. Med., 1930, XXIII, 1615.

PUTSCHER, W.: A Rare Diaphragmatic Anomaly. Centrbl. f. allg. Path. u. path. Anat., 1930, L, 97.

TRUESDALE, P. E.: Diaphragmatic Hernia in a Child, Aged One Year. Jour. Am. Med. Assn., March 14, 1931, XCVI, 847.

Esophagus

JACOBI, M., and RASCOFF, H.: Congenital Esophageal Stenosis Associated with Aberrant Ductus Arteriosus: Case Report. Am. Jour. Dis. Child., November, 1931, XLII, 1148.

OVERGAARD, A. P.: Roentgenologic Diagnosis of Lesions in Esophagus. Nebraska St. Med. Jour., September, 1931, XVI, 350.

STURTEVANT, M., SHAPIRO, L. L., and WALLACE, R. P.: Traction Diverticulum of the Esophagus. Am. Jour. Roentgenol. and Rad. Ther., February, 1932, XXVII, 187.

SUSSMAN, M. L.: Congenital Atresia of the Esophagus: Case Report. Am. Jour. Roentgenol. and Rad. Ther., December, 1931, XXVI, 894.

Foreign Bodies

BALLON, D. H.: A Molar Tooth in the Left Lower Bronchus. Canadian Med. Assn. Jour., December, 1930, XXIII, 821.

Ibid: A Fish Bone in the Trachea of a Sixteen-months-old Child. Canadian Med. Assn. Jour., December, 1930, XXIII, 822.

BROWN, A. L.: Foreign Body in the Esophagus for Three Years. Calif. and West. Med., May, 1931, XXXIV, 371.

GILL, E. G.: Portion of Safety Pin in Right Main Bronchus; Removal, Bronchoscopy. Radiol. Rev. etc., January, 1931, LIII, 13.

MCNAUGHTON, P. D.: Foreign Body in the Right Bronchus Not Shown by Roentgen Ray. Mil. Surg., January, 1931, LXVIII, 56.

SNELLER, C. D.: Pork Bone in Bronchus Causing Symptoms Simulating Pulmonary Tuberculosis. Laryngoscope, February, 1931, XLI, 117.

Ibid: Diagnosis of Non-opaque Foreign Bodies in the Bronchi with Special Refer-

ence to Roentgen Evidence. Radiol. Rev., etc., August, 1931, LIII, 185.

VINSON, P. P., and CAMP, J. D.: An Open Safety Pin in the Bronchus: Removal under Roentgenoscopic Guidance. RADIOLOGY, December, 1931, XVII, 1302.

Pleuritis and Pleurisy

DEMANT, M.: Roentgen Indications in Interlobar Pleuritis. Kinderärtzl. Praxis, February, 1931, II, 63.

FULTON, M. N., and HAHN, R. G.: The Subsequent Course of Forty Patients with Acute "Dry" Pleurisy. Jour. Am. Med. Assn., Dec. 26, 1931, XCVII, 1959.

INTERIAN, Z. P., VALDES, R. P., and Y PAEZ, J. M.: Considerations on the Inception of Axillary Pleurisy in Infancy. Rev. de med. y cir., July 31, 1931, XXXVI, 515.

LEUNDA, J. J., and CARRAU, A.: Bronchial Dilatation in the Infant Giving a Picture of Mediastinal Pleurisy. Bull. et mém. Soc. méd. d. hôp. de Paris, 1930, LIV, 58.

VETTORI, D.: Interlobar Pleurisy. Riv. di clin. med., Nov. 15, 1930, XXXI, 1121.

Miscellaneous

BÖHNE, C.: Apical Pleural Infiltration. Beitr. z. Klin. d. Tuberk., Sept. 17, 1930, LXXV, 164.

FORMAN, F.: Three Interesting Lung Cases. Jour. Med. Assn., South Africa, Aug. 22, 1931, V, 515.

GRIER, G. W.: Roentgen Diagnosis of Empyema. Pennsylvania Med. Jour., January, 1931, XXXIV, 242.

HEIMAN, H., and COHEN, P.: Peribronchial Infiltration in Children. Med. Clin. No. Am., September, 1930, XIV, 411.

HILDEBRANDT, W.: Whooping Cough. Monatss. f. Kinderh., June, 1931, L, 142.

LEAKE, J. P.: Radium Poisoning. Jour. Am. Med. Assn., March 26, 1932, XCVIII, 1077.

MANGES, W. F.: Relation of Sinus Disease to Pulmonary Infection, from the Standpoint of the Roentgenologist. West Virginia Med. Jour., October, 1930, XXVI, 588.

LE MARC'HADOUR, A., DUPIRE, P., and LOÉ, R.: Tracheobronchial Adenopathy in Children: Clinical and Roentgenologic Aspects. Paris méd., Nov. 28, 1931, II, 441.

STYGALL, J. H.: Diagnosis and Treatment of Non-tuberculous Suppurative Lung Lesions. Jour. Indiana Med. Assn., November, 1930, XXIII, 526.

UDE, W. H.: Roentgenologic Studies in Early Lobar Pneumonia. Am. Jour. Roentgenol. and Rad. Ther., November, 1931, XXVI, 691.

EXPERIMENTAL

Experimental studies which particularly pertain to radiology are few. Meller[84] is studying the anatomy of the pulmonary lymphatics, but he has no conclusions yet. Schall and Hoffman[85] were able to demonstrate the anatomy of the interlobar fissures in cadavers which they roentgenographed. According to Brdiczka and Wolf,[86] the normal interlobar fissure is the hair-line on the X-ray film. They state that it is found in about 42 per cent of normal cases, and that moderate thickening indicates an old pleuritic process, and marked thickening indicates interlobar adhesions. Miller[87] did some postmortem experimental work to determine whether calcified nodes and nodules can be seen on the roentgenogram. He feels that they can be recognized on the carefully taken film made with short exposure and synchronized with diastole. Meller and Menkes[88] found from their roentgenographic studies of child cadaver lungs which they

[84]Fortschr. a. d. Geb. d. Röntgenstrahlen, January, 1931, XLIII, 66.
[85]Fortschr. a. d. Geb. d. Röntgenstrahlen, December, 1930, XLII. 714.
[86]Röntgenpraxis, Nov. 15, 1930, II, 1014.
[87]Am. Jour. Roentgenol. and Rad. Ther., August, 1931, XXVI, 191.
[88]Fortschr. a. d. Geb. d. Röntgenstrahlen, August, 1931, XLIV, 197.

hydrated and reinflated under identical conditions, that during the stage of hydration there is a marked increase in pulmonary markings. They feel that more attention should be paid to the mesodermic pulmonary structures in roentgen interpretation.

Hypoventilation. — Overholt's[89] experimental work on dogs showed that the introduction of air into the peritoneal cavity either by injection or as a result of laparotomy, caused the diaphragm to assume a higher position and restricted its excursion definitely. Observations of hypoventilation in humans led the same investigator[90] to conclude that a marked degree of pulmonary hypoventilation exists for a variable period of time after abdominal operations. This is caused by a high position of the diaphragm and restriction of the diaphragmatic excursions. He deduces that the opening of the abdomen and the entrance of air permit the negative intrapleural pressure to draw the diaphragm higher in the thorax, and there is also a reflex splinting of the abdominal musculature because of pain. Janker[91] made some experiments on dogs to show the effect of changes in pressure within the thoracic cavity. He used the roentgencinematograph for recording his findings, and he feels that this device offers great possibilities in teaching demonstration and for experimental purposes.

Scalds.—Cordier and Magne[92] were anxious to know why circulatory and renal disorders follow the inhalation of steam. By experiments on animals, they found that scalds of the respiratory tract as a result of such inhalation are followed by absorption of toxic substances coming from the disintegration of the affected tissues, and that these poisons pass into the general circulation and are capable of causing the death of the animal.

Pneumonia. — Terrell and Robertson[93] were able to produce pneumonia in dogs by intrabronchial injection of 18-hour cultures of *Pneumococcus* Types I and II. They injected the material under fluoroscopic guidance, into a small bronchus as near the periphery as possible. As a rule, a typical lobar consolidation appeared within twenty-four hours. The condition manifested was similar to human disease in manner of spread; localization of process; immune response; abrupt termination by crisis, lysis, or death, and rapid regression of the process after recovery. It differed from the human disease in that there was a great degree of blood-vessel engorgement throughout the condition, a smaller amount of fibrin, and more rapid decrease in size of the resolving lung.

Post-measles.—Kohn and Koiransky[94] report roentgen re-examination of the chests of 56 children from six to ten months after measles. They found that abnormal intensity of the pulmonary markings as described during measles was no longer seen, previous pneumonic infiltrations showed little residual or no pulmonary changes, and the changes were described as localized accentuation of the pulmonary markings. In some cases, pleural thickening which had not been present during measles was seen at the site of the interlobar fissure between the upper and middle lobes of the right lung, or in some other portion of the pleura. This involvement occurred often in cases considered clinically mild. The density of size and the hilar shadows had diminished.

Old Tuberculin Injections.—The experimental work of Austrian and Willis[95] on the effects of intratracheal injections of Old Tuberculin in rabbits which had already had pulmonary tuberculosis, shows that focal areas of inflammation develop that are anal-

[89]Arch. Surg., December, 1930, XXI, 1282.
[90]Jour. Am. Med. Assn., Nov. 15, 1930, XCV, 1484.
[91]Deutsche Ztschr. f. Chir., Aug. 24, 1931, CCXXXII, 570.
[92]Ann. de physiol., 1930, VI, 584.
[93]Proc. Soc. Exper. Biol. and Med., June, 1930, XXVII, 973.
[94]Am. Jour. Dis. Child., March, 1931, XLI. 500.
[95]Am. Rev. Tuberc., March, 1931, XXIII, 310.

ogous to those represented in the pulmonary roentgenographs of tuberculous patients within a short time after an hemoptysis. They suggest that the changes they describe are due to a state of allergy. They feel that their findings indicate that what is often thought, from the roentgenogram, to be pulmonary miliary tuberculosis may not necessarily forecast a progressively advancing disease, and that a consequently gloomy prognosis is not always justified. They urge the importance of repeated roentgen examinations and correlations of clinical data to establish the evolution and outcome of the disease.

APPARATUS AND TECHNIC

Great advances are being made in the field of radiology, in the perfection of apparatus. The most outstanding of these is the presentation of equipment which will deliver 1,000 milliamperes routinely for diagnostic purposes.

Iodine Compounds.—Testimonials as to the value and limitations of the iodine compounds for diagnostic purposes may be found in abundance. Also, there are a number of reports of the varying methods of administering the compounds. (See the appended bibliography.)

Lateral Position.—The lateral roentgenogram has several staunch supporters. Brown[96] finds that in the lateral view, the diaphragm is pushed up by subphrenic abscess. He and Reinecke[97] found the lateral position especially valuable in the roentgen diagnosis of the superior and posterior mediastinum, and de Beaujeu[98] advocates its use as the only one which gives a view of the posterior and anterior mediastinum and the base of the lungs posteriorly. He feels it permits exact location of a pathologic process in the chest. Warfield[99] thinks it is important in localizing foreign bodies, in determining lung pathology, enlarged thymus, and in bronchiectasis with lipiodol injection.

Other Positions.—Other diagnostic positions are described by roentgenologists both in the United States and abroad. Rigler's[100, 101] lateral decubitus position and the recumbent position with the affected side down, of Hjelm and Laurell,[102] are probably similar as the former is valuable in demonstrating pleural effusions and the latter for pleural exudates.

Stereoscopy. — Stereoscopic roentgenography of the chest has long been accorded its proper place as a valuable diagnostic procedure, but there is a recent tendency toward more accurate methods of taking and viewing the stereoscopic roentgenogram. Sweany[103] studied the mechanical features which produce distortion, and he and Kegerreis and Cook[104] undertook consideration of the sources of error in intrathoracic localizations by stereoroentgenography. Their conclusions only emphasize anew the value of suspending as much movement as possible and consequently reducing the time. In England, the roentgenogram of the whole chest is evidently not a routine procedure. At a recent meeting, opinions were expressed on the value or lack of it of the stereoscopic examination of the chest. Stott[105] feels that because of almost insurmountable difficulties in stereoscopic thorax examination, for the clinician, the anteroposterior and lateral views are more dependable. He and Cruickshank [106] realize that the theoretical desideratum, namely, two films taken at the same instant under the same conditions, is physically impossible.

[96] Jour. Am. Med. Assn., Sept. 5, 1931, XCVII, 678.
[97] Am. Jour. Surg., December, 1930, X, 452.
[98] Jour. de radiol. et d'électrol., March, 1931, XV, 129.
[99] Illinois Med. Jour., December, 1930, LVIII, 461.
[100] Jour. Am. Med. Assn., Jan. 10, 1931, XCVI, 104.
[101] Am. Jour. Roentgenol. and Rad. Ther., February, 1931, XXV, 220.
[102] Upsala Läk. Förh., Aug. 15, 1931, XXXVI, 305.
[103] Am. Jour. Roentgenol. and Rad. Ther., February, 1932, XXVII, 257.
[104] Radiology, February, 1932, XVIII, 277.
[105] Tubercle, September, 1931, XII, 539.
[106] Tubercle, April, 1931, XII, 289.

APPARATUS AND TECHNIC—ADDITIONAL BIBLIOGRAPHY

Apparatus

BALLON, H. C.: New Light Attachment for Syringe to be Used for Injection of Iodized Oil and Medicaments into the Lung by Aspiration Method. Ann. Otol., Rhinol., and Laryngol., December, 1930, XXXIX, 1109.

LEVENE, G.: Simplified Dark-room Illumination. Am. Jour. Roentgenol. and Rad. Ther., March, 1932, XXVII, 435.

MOORE, S.: Method and Appliances for the Rapid Examination of Wet Roentgen-ray Films. Am. Jour. Roentgenol. and Rad. Ther., March, 1932, XXVII, 432.

Paris Foreign Correspondent: A Model Radiologic Service in Paris. Jour. Am. Med. Assn., March 5, 1932, XCVIII, 829.

WILHELMY, E., and WOLODKEWITSCH, N.: A New Device for Making Centered Instantaneous Roentgen Exposures. Fortschr. a. d. Geb. d. Röntgenstrahlen, December, 1930, XLII, 769.

Technic

CHRISTOPHERSON, J. B.: Radiostereoscopy of the Chest. Tubercle, September, 1931, XII, 532.

COLA, G.: Two Cases of Exceptionally Long Delay in Eliminating Iodine after Bronchography. Arch. di radiol., May-June, 1931, VII, 525.

EDWARDS, H. G. F.: A New Method of Studying Chest Films. RADIOLOGY, September, 1931, XVII, 581.

EDWARDS, P. W.: Stereoscopic and Postural Radiology of the Chest. Tubercle, September, 1931, XII, 529.

ERLANDSON, S.: Complications in the Intratracheal Injection of Lipiodol. Beitr. z. Klin. d. Tuberk., Nov. 22, 1931, LXXVI, 105.

FAULKNER, W. B., JR., and GLASER, M. A.: Campiodol (Iodized Rapeseed Oil); Its Use in the Diagnosis and Treatment of Intrathoracic Diseases. Am. Jour. Surg., March, 1931, XI, 522.

IGLAUER, S.: Advantages of Intubation Method of Introducing Iodized Oil for Bronchography in Children. Jour. Am. Med. Assn., Nov. 21, 1931, XCVII, 1517.

JOSEFSON, A.: A New and Ideal Method for Injections of Iodized Oils and Other Fluids in Lungs. Am. Jour. Surg., April, 1931, XII, 143.

JUNG, T.-S., and VAN ALLEN, C. M.: A Method of Recording Respiratory Movements on a Single Roentgenogram. Nat. Med. Jour., China, April, 1931, XVII, 195.

LISLE-PUNCH, A.: Value of Lipiodol in Investigation of Intrathoracic Conditions. British Jour. Tuberc., January, 1931, XXV, 18.

MORVAY, E.: Foreign-body Granulations in the Lung after Diagnostic Bronchography. Röntgenpraxis, July 1, 1931, III, 581.

SPRAWSON, C. A.: Certain Movements of the Lung and the Effects of Phrenic Evulsion Thereon. Tubercle, May, 1931, XII, 337.

TARTAGLI, D.: The Anteroposterior Projection of Oblique Profile for the Examination of Only One Lung. Radiol. med., December, 1930, XVII, 1388.

THOMAS, H.: A Graphic Method of Recording the Respiratory Excursion of the Diaphragm. Am. Jour. Roentgenol. and Rad. Ther., December, 1931, XXVI, 878.

TRAMBUSTI, B.: Roentgenography of the Respiratory Apparatus of Children after the Postmortem Injection of Opaque Contrasting Substance. Riv. di clin. pediat., December, 1930, XXVIII, 1111.

ZIMMERN, A., and ARVANITAKIS, G.: Roentgenography of Discrete Lung Lesions. Jour. de radiol. et d'électrol., January, 1931, XV, 1.

THERAPY

Animal Experiment.—Lüdin and Werthemann[107] were motivated by the description given by a number of clinicians of the changes in the lung following intense X-ray therapy over the chest. They experimented on two groups of animals, using two different-sized areas, and the same dosage and other factors. They treated the animals until they died. The pathologic changes found were essentially bronchopneumonia with exudative bronchitis and edema of the lungs with extensive proliferative processes in the epithelium of the bronchi. Sometimes the changes resembled the histologic picture found in carcinoma. Krebs, Rask-Nielsen, and Wagner[108] report that lymphosarcoma tissue from irradiated white mice, when implanted in other mice, did not take when the dose was two erythema doses, and the percentage of takes was considerably reduced when the dose was from one to one and five-tenths. Also, one to two erythema doses often had an inhibitory effect on lymphosarcomas from the size of a pea to that of a walnut, in live animals. The authors conclude that, from the fact that two erythema doses do not always produce such complete disappearance, the effect of the irradiation on the tumor tissue *in vitro* is not absolutely lethal, but only sufficiently inhibitory to prevent it, when implanted, from overcoming the natural resistance of the organism.

Radium (Breast).—Deutwitz[109] treated with radium two cases of bleeding breast. Both cases were well, one twelve years after treatment, and the other, seventeen years after. He advises its use in patients who refuse operation, and in those upon whom the surgeon hesitates to operate because he can find no definite tumor mass. He details technic, and refers to 22 cases by Hirsch.

Roentgen (Lymphogranulomatosis).—Billich[110] uses roentgen therapy to lengthen life and as a palliative measure for lymphogranulomatosis. In 31 cases, in all of which the diagnosis was confirmed histologically, 35.5 per cent lived two years or longer, 29 per cent lived three years or longer, and one boy of nine years was alive five years later, with no evidence of the disease. Billich irradiates the glands only.

Roentgen (Asthma).—Zipperlen[111] tried roentgen therapy in bronchial asthma about 1906, after Schilling reported improvement by means of it. However, the former was dissatisfied and discontinued its use. Five years ago, he began the systematic use of the X-rays in treatment of the condition. He reports his technic and 15 cases cured, 15 improved, and 9 upon which there was no noticeable effect. Gonzales[112] recognizes five types of bronchial asthma according to the etiology. He uses roentgen therapy during the intervals between attacks in asthma associated with tracheobronchial adenopathy or chronic bronchitis, and sometimes he irradiates the spleen in asthma caused by anaphylaxis. He says there are conflicting opinions as to the value of therapy in asthma associated with pulmonary tuberculosis.

Roentgen (Pneumonia).—Merritt and McPeak[113] used roentgen irradiation to stimulate delayed resolution of a case of lobar pneumonia before they knew it had been used in that way by Edsall and Pemberton in 1907. It was so successful for their first patient that they standardized the procedure and used it on six more. All but one responded well; four cleared entirely; two improved definitely, and the one was unchanged. (In this case the diagnosis was not positively pneumonia.) They suggest using irradiation in all pneumonias which evince delayed resolution three weeks after the onset.

[107]Strahlentherapie, Nov. 29, 1930, XXXVIII, 684.
[108]Acta radiol., Nov. 15, 1930, II, 487.
[109]Strahlentherapie, 1930, XXXVIII, 710.
[110]Strahlentherapie, 1930, XXXVIII, 141.
[111]Strahlentherapie, 1930, XXXVIII, 88.
[112]Arch. esp. de ped., September, 1930, XIV, 545.
[113]Radiol. Rev. etc., February, 1931, LIII, 31.

THERAPY—ADDITIONAL BIBLIOGRAPHY

BIRCHER, F.: Sunburn: Treatment with Rays of Long Wave Length. Schweiz. med. Wchnschr., Aug. 8, 1931, LXI, 770.

COBLENTZ, W. W.: Ultra-violet Radiation Useful for Therapeutic Purposes: Specification of Minimum Intensity, or Radiant Flux. Jour. Am. Med. Assn., March 26, 1932, XCVIII, 1082.

KAPLAN, I. I.: The Emergency Value of Roentgen Therapy in Pediatrics. Arch. Ped., May, 1931, XLVIII, 330.

PRETTS, W. W.: Low Mortality Rate in Respiratory Diseases. Med. Bull. Vet. Admin., August, 1931, VII, 752.

SCHMIDT, P.: Treatment of Hay-fever. Med. Klin., May 29, 1931, XXVII, 805.

SCHREUS, H. T., and WILLMS, E.: Clinical Investigations in the Antiallergic Treatment of Asthma, Eczema, and Hay-fever. München. med. Wchnschr., May 15, 1931, LXXVIII, 832.

TROSTLER, I. S.: Roentgenotherapy of Conditions Other than Malignancy. Illinois Med. Jour., August, 1931, LX, 113.

"Progress in Radiology during 1931" to be continued

Oxygen Artificially Disintegrated by Using Neutron Projectiles.—Oxygen has been artificially disintegrated by bombardment with neutrons in experiments at the famous Cavendish laboratory at Cambridge, it has been announced in a communication to the British scientific journal, *Nature,* by Dr. N. Feather, of Cambridge. Photographs were obtained of the recoil and paired tracks of the results of the disintegration produced in an oxygen-filled expansion chamber. Polonium and beryllium at the center of the chamber provided the neutrons which hit and smashed the oxygen atoms.

The capture of the incident neutron seems likely in all observations made by Dr. Feather, and he concludes that the disintegration particle is almost certainly an alpha particle or the heart of a helium atom.

The results show an absorption of energy and confirm the suggestion made recently by Mme. Curie that a small fraction of the beryllium radiation has a higher energy than the previous upper limit.

Although Lord Rutherford in 1919 and succeeding years performed the first artificial disintegrations of a number of elements, notably nitrogen, by bombardment with alpha rays, he did not break down oxygen. His colleague has now done so, using neutrons.—*Science Service.*

HEPATOLIENOGRAPHY WITH THE USE OF THOROTRAST[1]

By C. H. WARFIELD, M.D., Director, Department of Roentgenology, Cook County Hospital, CHICAGO

FOR many years, although it has been possible to visualize the size of the liver and spleen by pneumoperitoneum, it has been impossible to visualize gross lesions within these organs. Now a method has been advanced by which the density of the normal liver and spleen can be increased and the gross pathologic lesions remain of the same density as before.

Keith and Briggs (1), using an iodized rapeseed oil, visualized the spleen while attempting to visualize the blood vessels. Owing to the danger of oil embolism, this method never gained popularity and was not tried on patients. The author used the same material, producing death in dogs and rabbits. Later Radt (2), using a solution of thorium dioxide, was able to visualize the liver and spleen in animals. He then used it in humans, demonstrating gross changes in the liver and spleen. At this time, he felt that thorium was a toxic substance when injected in large doses, and so he gave repeated small doses without any clinical danger to the patient. Oka (3) later repeated this work with thorium dioxide, using about the same technic. He came to the same conclusions as Radt, except that he theorized that the cells of the reticulo-endothelial system were destroyed. He showed definitely that injections of adrenalin caused no change in the density of the spleen, and also that large doses caused a decrease in the red blood corpuscles and hemoglobin as well as the mononuclear leukocytes, transitional cells, and platelets in rabbits. Six cases, with no bad results, were reported.

Probably the best, as well as the most scientific and extensive, work has been done by Kadrnka (4). Using a stabilized thorium dioxide solution known as thorotrast (Heyden), he has conducted extensive experiments on animals and has carried this work on in patients with good results and no reported deaths.

Fig. 1. Barium enema showing the defect of the cecum prior to resection.

His technic consisted of small doses for several days. The first dose was 0.1 c.c. per kg. of body weight, then increased 0.1 c.c. for each succeeding dose up to five doses, the total amount not exceeding from 0.8 to 1 c.c. per kg. of body weight. He proposed that small amounts of thorotrast increased the resistance of the patient.

Thorotrast (Heyden) is a stabilized colloidal solution containing 25 per cent thorium dioxide. It is miscible with all body

[1]I wish to thank A. J. Toman, M.D., and W. L. Benishek, M.D., for their splendid help, and the Heyden Chemical Corporation for supplying the thorotrast.

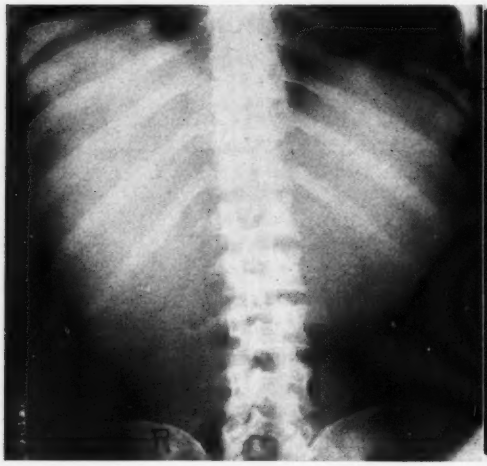

Fig. 2. Preliminary film of the abdomen before injection of thorotrast to show the uniform density of the right side of the abdomen.

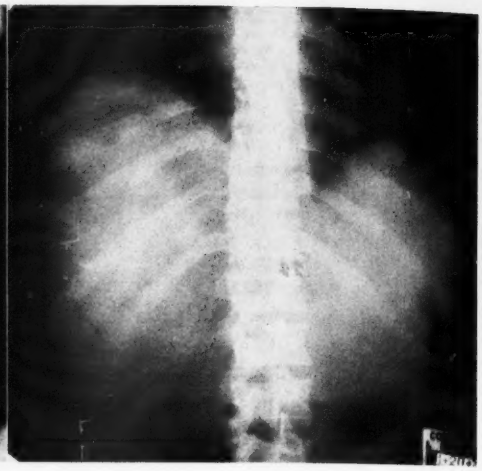

Fig. 3. The appearance of the liver shadow after the injection of thorotrast. Note the many irregular areas of lessened density in the liver shadow, indicating the metastatic lesions.

fluids without being flocculated or otherwise affected. It is very stable, milky in reflected light, and a transparent, colorless, or brownish solution in transmitted light. It is put up in sterile ampules and is not poisonous, nor is it resorbed. The above chemical statements have been confirmed by Dr. Gross, Institute of Pharmacology, University of Leipzig.[2]

Baumann and Schilling (6) quote Aschoff regarding the pathology of the liver and spleen following the injection of thorotrast, which work was done on animals. Aschoff states that, 15 minutes after the injection of thorotrast, one sees in the liver of rabbits small, shining, unstained particles in Kupffer's cells and the reticulo-endothelial cells of the spleen pulp. Twenty-four hours after injection, these cells are loaded with large, shining, silvery particles. In 14 days, the cells, which are swollen to the size of liver cells, still contain the large, shining, silvery particles. At the present time, no further pathologic data have been quoted nor reasons given why thorium dioxide is stored by the reticulo-endothelial system.

[2]As quoted by the Heyden Chemical Corporation.

I am indebted to R. H. Jaffe, M.D., pathologist to the Cook County Hospital, for describing the mechanism of storage of the thorium by the reticulo-endothelial system. Thorium dioxide, like other electronegative colloids of proper dispersity, is quickly absorbed by these cells, which later take it in and precipitate it by way of intracellular flocculation. Thus, the colloidal metal becomes visible as highly refractile cellular inclusions of various shapes.

The radio-activity of thorotrast should be considered, since it contains 25 per cent of thorium dioxide, which is a radio-active element. Kadrnka (5) quotes the Radium Institute of the Mining Academy of the University of Freiburg, which examined thorotrast for its radio-activity. In 100 c.c. amounts, it contains radio-active substance, the gamma radiation of which is equivalent to the gamma radiation of 1.24×10^{-6} radium.

Baumann and Schilling (6) state that a radium element of the strength $+ 3.6 \times 10^{-5}$ "and a certain amount of thorotrast were put on an X-ray film for 48 hours and then developed. While the radium blackened the

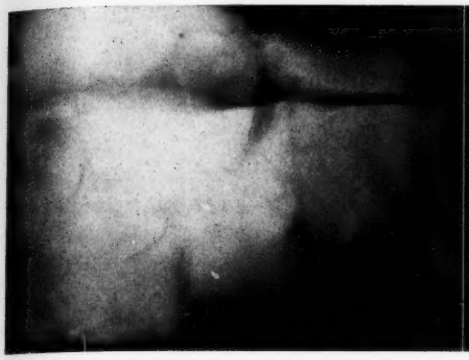

Fig. 4. Film of a metastatic liver that was not injected with thorotrast.

Fig. 5. This film of the liver was taken after autopsy to show the many areas of lessened density, representing the metastases. Note also the increased density of the normal liver.

film considerably, there was not the slightest change visible caused by the thorotrast."

In a personal communication regarding the radio-activity of this amount of thorotrast, Roy Kegerreis, M.D., says that it is a negligible amount, and less, since it is spread over such a large surface. Our simple test, placing the liver on an X-ray film for 36 hours, showed no images.

Nothing is known regarding the elimination of thorotrast. Kadrnka (5), who observed it three months after injection, states that the density of the liver and spleen had decreased about 50 per cent. Bauke (7) showed a slight decrease in density two months after injection. Baumann and Schilling (6) injected adrenalin to speed up elimination, but with no results. Buengeler and Krautwig (8) state that thorotrast is dangerous, since we know nothing of its elimination or radio-activity over a long period of time. They also state that it is poisonous in large doses. Dr. Jaffe states that, several months after the injection of colloidal gold, one sees it massed in a few cells, the other cells giving up the pigment and assuming their normal appearance. It is possible that thorotrast will have the same properties.

Practically all authors agree on the technic of injection, namely, the fractional method. A total of from 0.8 to 1 c.c. per kg. of body weight is needed to bring satisfactory results. It is best to inject 0.1 c.c. per kg. for the initial dose. The next four doses should be 0.2 c.c., 0.2 c.c., 0.2 c.c., and 0.3 c.c. per kg., respectively. Injections should be made daily until the fifth dose has been administered. The total dose does not need to exceed 75 c.c.; in fact, we obtained good results with 50 c.c. as our total dose. The films are made 24 hours after the last injection. We employed the Potter-Bucky diaphragm, using low voltage and long time exposures to obtain maximum contrast.

Case 1. The patient, a male, aged 38 years, entered the Cook County Hospital on April 4, 1931, with symptoms of increased constipation and cramp-like pain in the right lower quadrant. These were interpreted as a carcinoma of the cecum, a diagnosis which was verified by roentgen examination. The cecum was removed, as well as the involved regional lymph glands, and a lateral anastomosis of the ileum and sigmoid was effected. The patient made an uneventful recovery and, except for diarrhea, was free from symptoms for several months. However, for the six months preceding the

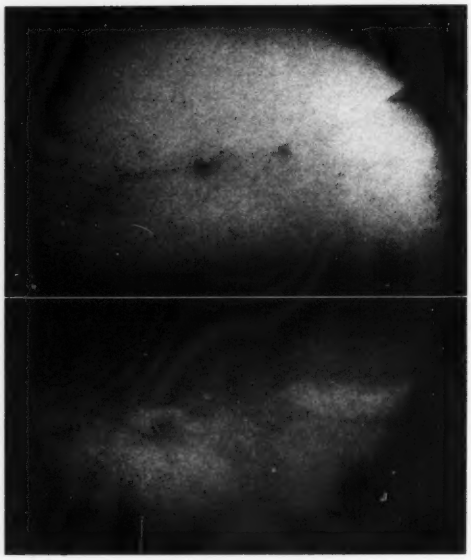

Fig. 6. No. 1 is the spleen which has been injected with thorotrast. No. 2 has not been injected. Note the markedly increased density caused by thorotrast.

present examination, he has noticed loss of weight, marked weakness, and shortness of breath.

Physical examination showed an emaciated, colored male with temperature of 102.2° F., respiration 26, pulse 104, and blood pressure of 130/0. The essential findings were: fluid in the right pleural cavity, masses in the right lower quadrant, and an enlarged, nodular liver. The impression was of metastases to the liver and local recurrence of the primary tumor.

We chose this as our first case, since we had the pathologic diagnosis of the primary tumor, a palpable, nodular liver, and permission for autopsy. For a control, we first made a preliminary film of the upper abdomen. As the patient weighed 53 kg., the following amounts of thorotrast were given:

First day, 5.3 c.c.;
Second day, 10.6 c.c.;
Third day, 10.6 c.c.;
Fourth day, 10.6 c.c.;
Fifth day, 15.9 c.c.

Each day a very careful clinical check was made on the patient to determine if there were any signs of reaction. Through these, we are able to say that the injections were uneventful; in fact, they were like those of normal saline. We feel safe in saying that, in the four cases injected, we had not the slightest reaction.

In 24 hours after the last injection we made films which showed very clearly the metastatic lesions. While the patient died a few weeks later with the usual terminal findings of a metastatic carcinoma, we feel sure that the thorotrast did not precipitate his death.

The following is a detailed report from the Department of Pathology.

Anatomic Diagnosis.—Metastases of a recurrent adenocarcinoma of the cecum, to the liver, the peripancreatic, peribiliary, perigastric, peri-aortic, mesenteric, and pulmonary hilus lymph nodes, and to both adrenals, the right kidney, and the greater omentum. Surgical removal of the cecum, the lowermost portion of the ileum, and the ascending portion of the colon, with an ileosigmoidostomy. Localized recurrence of the primary tumor at the site of the ileosigmoidostomy and in the peritoneum at the line of the abdominal incision. Healed laparotomy wound. Parenchymatous degeneration of the myocardium and kidneys. Softening of the spleen. Bilateral hydrothorax and hydropericardium. Ascites and edema of the ankles. Thorium dioxide deposits in the Kupffer cells of the liver, the reticular cells of the splenic pulp and bone marrow, sinus endothelium of the axillary lymph nodes, and stroma of the kidneys.

External Findings.—The subject was an emaciated, colored male. The pupils were equal and dilated, the lips and finger nails cyanotic, the abdomen slightly distended. There was slight pitting edema of the ankles. There was an ancient, healed, pararectal laparotomy wound on the right side,

16 cm. in length. The scleræ were slightly icteric.

Abdominal Cavity.—Midline fat was practically absent. The cavity contained about 200 c.c. of clear, yellow fluid. The liver was 6 cm. below the xiphoid and 4 cm. below the right costal margin. There was a firm, yellow-gray mass, 4 cm. in length, protruding from the inferior surface of the liver. One of the loops of the ileum was firmly adherent to the abdominal scar, with firm, whitish nodules, 1 cm. in height, present along the line of adhesion.

Pleural Cavities.—Diaphragm: left, fifth interspace; right, indeterminate. The left cavity contained about 1,500 c.c. of clear yellow fluid. The right exhibited focal, fibrous adhesions at the base and apex, and contained about 250 c.c. of clear, yellow fluid.

Pericardial Sac.—This sac contained about 50 c.c. of clear yellow fluid.

Heart.—This organ weighed 200 grams. The left ventricle was 15 mm., the right, 2 millimeters. The myocardium was purple-brown, soft and friable.

Aorta.—The size was 64, 41, and 26 millimeters at three different levels. Single, hyaline plaques were seen *in ascendens.*

Arteries.—The coronaries exhibited a few hyaline plaques, but were otherwise thin-walled.

Lungs—These were distended and ranged from crepitant to subcrepitant throughout. The hilus lymph glands, some of which were as large as 5 cm. in diameter, were firm, purple-gray, mottled with black. On section, the right lung was seen to be yellow-gray and moist. The lower lobe was non-crepitant. The left lung was yellow-gray. Sectioned surfaces were found to be moderately moist.

Thyroid.—The gland, which weighed 5 gms., was uniformly finely granular.

Stomach.—Along the lesser curvature of this organ was a linear arrangement of

Fig. 7. Gross specimen of the liver, showing the large metastatic lesions.

nodes up to 2.5 × 1.5 × 1 cm. in diameter. The glands about the cardia were firm, up to 15 cm. in diameter and yellow-gray. On section, the mucosa was found to be smooth; the rugæ were distinct and thrown into small mammillary folds.

Spleen.—The weight was 150 grams. The capsule was thickened and purple-gray with single, yellow-gray plaques. A sectioned surface was seen to be purple-red with indistinct follicles.

Liver.—The liver, which weighed 3,460 gms., was firm and deformed by numerous nodes up to 6 cm. in height. Many of these had a soft center and were raised above the hepatic surface. On the upper surface, the organ was closely adherent to the diaphragm. A sectioned surface was seen to be studded by nodes as previously described, one on the surface reaching for 7 cm. into the parenchyma. The parenchyma was purple-brown; the markings were obscured.

Pancreas.—This gland was 16 × 3.5 × 2 cm. in size, yellow-gray and lobulated. The

peripancreatic glands formed a mass measuring 5 × 3 × 4 centimeters.

Intestines.—The large intestine was pale purple-pink, with the mucosa covered by mucus. The small intestine was similar.

Kidneys.—The kidneys, which were firm, weighed 260 grams. In the right kidney, the lower and upper poles each presented a

Fig. 8 *(left).* Lymph node, showing the thorium dioxide crystals in proliferated sinus endothelium (× 1,200).

Fig. 9 *(right).* Liver, showing the Kupffer cells filled by crystals of thorium dioxide (× 1,200).

There was a surgical anastomosis between the ileum and the sigmoid. There were many firm nodules, up to 3 cm. in height, which had infiltrated the wall of the ileum and sigmoid and were also present over the line of surgical interference. At the angle of anastomosis was a cyst, 2 cm. in diameter, containing clear, straw-colored fluid. The surface nodes penetrated the wall but the mucosa was intact. The anastomotic ostium, which was 1.5 cm. in diameter, showed no nodular invasion.

Adrenals.—The adrenals, which weighed 130 gms., were firm and covered by fibrous adhesions. On section, the parenchyma was seen to be entirely replaced by firm, yellow nodules, up to 2 cm. in size.

node 1 cm. in diameter. The capsule was stripped with slight difficulty, leaving a smooth, purple-gray surface. Sectioned surface showed the cortex to be 8 mm., with fairly distinct markings; the pelvic mucosa was pale.

Pelvic Organs.—The mucosa of the urinary bladder was pale. The prostate was 3.5 × 1.5 × 2 cm., firm and purple-pink. Several prostatic veins were thrombotic.

Bone Marrow.—The marrow was soft, brownish-gray, and quite fatty.

Brain.—The brain, which weighed 1,280 gms., was of soft consistency, with slightly

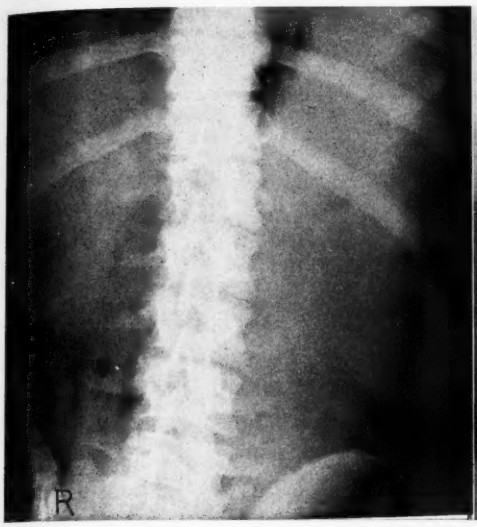

Fig. 10. A case of splenomyelogenous leukemia before injection with thorotrast.

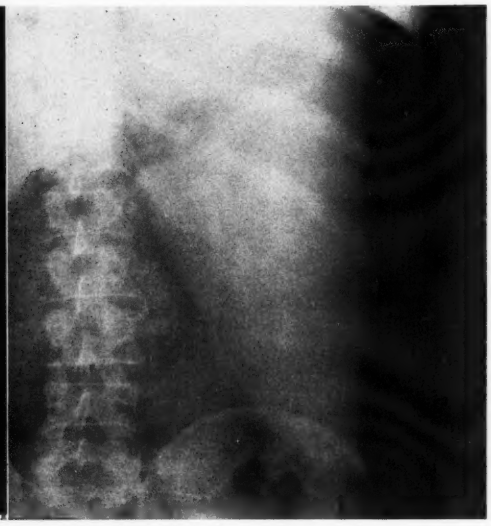

Fig. 11. Same patient as in Figure 10, after injection of thorotrast. Note the increased density of the spleen as well as its outline.

flattened convolutions; vessels at base of brain.

MICROSCOPIC EXAMINATION

Bone Marrow.—The fat tissue was partly replaced by pale stained, finely fibrillar material, which seemed to have accumulated in the body of the fat cells. Scattered between these structures were small groups of lymphocytes and normoblasts. The reticular cells were filled by highly refractive, light gray-brown to yellow-gray crystals.

Adrenal.—This gland was almost completely replaced by tumor tissue which showed extensive regressive changes. The glandular structure of the tumor was well maintained; between the glands there was a delicate stroma.

Liver.—The Kupffer cells, which were very much swollen and increased in number, were stuffed by small, highly refractile, light gray to yellowish-gray crystals. In the numerous metastases similar cells were present. They were found in the stroma between the tumor cells and were quite numerous, though less numerous than in the liver parenchyma. The liver cells were small and atrophic, containing darker brown pigment granules. The crystals in the Kupffer cells and in the stroma of the metastasis did not give the iron reaction.

Spleen.—The sinuses, which were wide, contained only a few small round cells and mononuclear, large phagocytes. The endothelium was swollen, but free from pigment. The reticular cells of the pulp were swollen, being filled by grayish-brown and light gray granules which gave a distinct iron reaction. In the meshes of the pulp were numerous plasma cells. The follicles were small and lymphocytic.

Lung.—The wide alveoli contained single cells filled by coal pigment. There were no thorium-containing elements present. The alveolar septa were thin and moderately cellular.

Axillary Lymph Gland.—The sinuses were wide and filled by proliferated endothelial cells which contained much of the light gray, highly refractile pigment.

Kidney.—There was a circumscribed

Fig. 12. A case of nodular liver, following the removal of an eye for melanoma. Note the areas of lessened density in the liver shadow.

node, composed of irregular, tubular glands, and a delicate, fibrillar stroma containing a few isolated glomeruli. Outside of the metastasis, the renal parenchyma was well preserved. In the stroma were a few flat and branched cells, filled by light gray crystals.

Peripancreatic Lymph Node.—This was completely replaced by glandular tumor tissue with focal areas of degeneration. Cells containing pigment were not found.

Peri-aortic Node.—Only a few small islands of lymphatic tissue were seen in the periphery of the glands, the remaining part being composed of tumor tissue.

Local Recurrence of Tumor in Ileum.—Irregular tubular glands, lined by low cylindrical, darkly nucleated epithelium, were separated by a finely fibrillar and cellular stroma. There were many foci of necrosis with karyorrhexis.

Brain.—The meninges showed a slightly increased cellularity. Pigmented cells could not be found.

We also used thorotrast with good results, in a case of splenomyelogenous leukemia to demonstrate the size of the spleen. The thorotrast caused no changes in the white blood count of this patient nor was there any change in the size of the spleen six months after injection. This patient was injected as an ambulatory case, without the slightest reaction. At present, although he still has symptoms of leukemia, apparently none is the result of thorotrast.

The third case presented palpable tumors in the abdomen, one of which was thought to be the spleen. This patient was injected with thorotrast, which showed the palpable tumor was not the spleen, since the latter was not enlarged.

The fourth case was rather obscure except for an enlargement of the liver which was thought to be metastatic, of obscure origin. Thorotrast showed the liver enlarged but with no metastases.

The fifth case was that of a very large nodular liver that followed the removal of an eye for melanoma. Figure 12 shows the enormous size of the liver, which was successfully visualized with 50 c.c. of thorotrast. The patient suffered no reaction during or after the injections.

The indication for the use of thorotrast is still in doubt, yet the author feels that it can be used safely in cases in which one expects to see gross changes in the liver and spleen. The sizes of these organs can be determined either by palpation or pneumoperitoneum, so that, in many conditions, it will add nothing to the older methods. In the following conditions it should be valuable: Primary and secondary carcinoma and sarcoma; adenoma; angioma; actinomycosis; hydatid disease (echinococcus).

In splenic conditions, it will be valuable in infarcts and especially thrombosis of the splenic artery. The latter is seldom diagnosed during life.

We feel that the contra-indications would

be jaundice and fever, but we do not feel that there is any danger in anemias, leukopenias, or the leukemias.

REFERENCES

(1) KEITH, W. S., and BRIGGS, D. R.: Roentgen-ray Visualization of the Spleen Following the Injection of Emulsions of Halogenated Oils. Proc. Soc. Exper. Biol. and Med., March, 1930, XXVII, 538-540.

(2) RADT, P.: Eine Neue Methode zur röntgenologischen Sichtbarmachung von Leber und Milz durch Injektion eines Kontrastmittels (Hepato-lienographie). Med. Klin., Dec. 19, 1930, XXVI, 1888-1891.

(3) OKA, M.: Klinische Anwendung der "Lienographie" einer Neuen Methode zur röntgenologischen Darstellung von Milz und Leber. Fortschr. a. d. Geb. d. Röntgenstr., June, 1930, XLI, 892-898.

(4) KADRNKA, S.: Hépatosplénographie. Méthode radiologique d'exploration du parenchyme hépatique et splénique par introduction intraveineuse de "thorotrast," substance colloïdale à base de dioxyde de thorium. Schweiz. med. Wchnschr., May 2, 1931, LXI, 425-428.

(5) Idem: Hepatosplenography. Fortschr. a. d. Geb. d. Röntgenstr., July, 1931, XLIV, 9-15.

(6) BAUMANN, H., and SCHILLING, C.: Zur Kontrastuntersuchung von Milz und Leber. Klin. Wchnschr., July 4, 1931, X, 1249-1252.

(7) BAUKE, E. E.: Milztumordiagnose vermittelst des neuen Kontrastverfahrens nach Radt. Deutsche med. Wchnschr., July 3, 1931, LVII, 1148, 1149.

(8) BUENGELER, W., and KRAUTWIG: Ist die Hepatolienographie mit Thorotrast eine Unschaedliche Methode? Klin. Wchnschr., January, 1932, IV.

Cosmic-ray Intensity Increases with Latitude.—Cosmic rays do not bombard the earth with equal intensity from all directions but their strength increases with the distance north and south of the earth's equator, Dr. A. H. Compton, Nobel prize physicist of the University of Chicago, reports.

This results from an extensive world-wide survey during which many physicists have made observations in remote localities. Dr. Compton transmitted this initial report from the Tasman Sea, during travel to new observing stations after research at Hawaii, New Zealand, and Australia.

The definite differences in the intensity of the cosmic rays at different latitudes are likely to upset present ideas of the origin and nature of the cosmic radiation. Dr. Robert A. Millikan, of the California Institute of Technology, like Dr. Compton a Nobel prizeman, has consistently found that the intensity of the cosmic radiation is independent of the latitude at which the observations are made. Dr. Compton's report does not confirm Dr. Millikan's findings.

Dr. Millikan has suggested that the cosmic rays may be the birth cries of the synthesis of heavy elements out of hydrogen and helium in the depths of the universe. This theory is based upon his findings from wide-flung researches that cosmic radiation bombards the earth equally from all directions. With Dr. Compton's report this theory is likely to lose support. Dr. Compton reports that so far as the measurements have gone they indicate "uniform variation with latitude, showing a minimum at or near the equator and increasing intensity toward the north and south poles."

At sea level, the difference between intensity at latitude 45° and 0° is roughly 16 per cent, whereas at an elevation of 9,000 feet the difference is about 23 per cent. This would indicate, Dr. Compton says, that it is the least penetrating part of the cosmic rays which varies most rapidly with latitude. No significant variations with longitude have been noted.

Observations recorded in Dr. Compton's report include those made from Mt. Evans in the United States, from the Jungfraujoch in Switzerland, as well as the measurements made by Dr. Compton and associates during this present extensive trip.

Prof. R. D. Bennett, of the Massachusetts Institute of Technology, has planned with Dr. Compton the world-wide survey which is being supported by the Carnegie Institution of Washington.—*Science Service.*

MEDICO-LEGAL DEPARTMENT

Selected by I. S. TROSTLER, M.D., CHICAGO

Examining physician is agent of employer; therefore, injury produced during examination is not actionable as malpractice, but is for bodily injury against physician's employer.—[New York Central Railroad Co. *vs.* Wiler (Ohio), 177 N.E.R. 205.] Wiler, employed as a locomotive fireman by the New York Central Railroad Company, was directed to submit to an examination by the company's physician, so that the company might know his physical condition. He complied. Later he sued the company, alleging that its physician, while he was feeling with his fingers under and around Wiler's left groin, used unusual and unnecessary force and thereby caused a hernia. To Wiler's petition, the company filed a demurrer, which the trial court sustained. On appeal, however, the Court of Appeals, Lucas County, reversed that judgment and remanded the cause for further proceedings. Thereupon, the company appealed to the Supreme Court of Ohio.

On behalf of the company it was contended that when a railroad company employs a physician to render any service for it and for its own purpose, which service that physician in his professional capacity might render to a patient for the patient's own purpose, the duty of the railroad company ends with the exercise of reasonable care in the selection of the physician. In support of this contention, the company relied on a decision by the Supreme Court of Ohio, in Youngstown Park & Falls Street Ry. Co. *vs.* Kessler, 84 Ohio St. 74, 95 N.E. 509, which arose out of the treatment of Kessler by the company's physician for an injury received by Kessler in alighting from one of the company's cars. The purpose of the treatment in that case, however, said the Supreme Court, was to cure Kessler's injury. It was directly for the benefit of Kessler. If it was for the benefit of the company at all, it was only indirectly so, in mitigation of the damages it might be required to pay for causing the injury. That situation, the court held, created the relationship of physician and patient between Kessler and the company's physician. The fact that the company assumed the obligation to compensate the physician for the service he rendered did not alter that relation.

But in the present case, said the Supreme Court, the purpose of the examination was not to treat or cure Wiler, an employee of the appellant railroad company. It was to inform the company of his physical condition, so as to enable it intelligently to determine whether it could safely and profitably continue him as one of its employees. The examination was for the benefit of the company, and not for the benefit of the employee. Under such circumstances, the relationship between the company and its examining physician was that of master and servant, unqualified by the circumstance that the servant was as a matter of fact a physician. *The action, therefore, was not an action for malpractice* and subject to the statute governing the limitation of actions for malpractice. *It was an action for bodily injury* and the time within which action might be brought was determinable by the statute relating to actions for bodily injuries.

The judgment of the Court of Appeals remanding the cause to the trial court for further proceedings was affirmed.[1]

Note.—This might just as well, and should, apply to a roentgen examination and a roentgen injury. (Italics mine.)—*I. S. T.*

Election to proceed, and award under

[1]Reprinted by permission from the *Journal of the American Medical Association.*

Workmen's Compensation Act is a bar to action for malpractice against physician.—[Revell *vs.* McCaughan (Tenn.), 39 S.W.R. (2nd) 269.] Revell instituted proceedings against his employer and his employer's insurer to recover compensation under the Tennessee workmen's compensation act. He averred that because of an industrial accident his index finger and the first joint of the little finger of his right hand had to be amputated and that because of blood poisoning that occurred as a complication he permanently lost entirely the use of his right hand and right arm. He was awarded compensation. Thereafter he brought this action, charging with malpractice the defendant, the physician who at the instance of his employer treated him when he was injured. Revell admitted that the injury to his finger was the result of the accident. In this action, however, he claimed that the loss of the use of his arm, the pain, and his other injuries were due to the defendant's malpractice. The defendant-physician pleaded that the settlement by the employer in the previous proceedings barred this action by the employee, Revell. The trial court thereupon dismissed the suit and Revell appealed to the Supreme Court of Tennessee.

It appears, said the Supreme Court, that the injuries for which the greater part of the compensation under the workmen's compensation act was awarded were due to the negligence of the physician. They were, therefore, injuries creating in a person other than the employer—namely, the physician—a legal liability to pay damages. Under such circumstances the workmen's compensation act gave Revell the option of claiming compensation from his employer under the act, or of proceeding at law against the person immediately responsible for his injuries, the physician, or of proceeding at law against both his employer and his physician. The workmen's compensation act, however, expressly provides that a workman situated as Revell was shall not be entitled to collect damages both from his employer and from the third person immediately responsible for his injuries, but that "if compensation is awarded under this Act the employer having paid the compensation or having became liable therefor may collect, in his own name or in the name of the injured employee in a suit brought for the purpose, from the other person in whom legal liability for damages exists, the indemnity paid or payable to the injured employee."—Pub. Acts, 1919, c. 123.

Revell, having elected to proceed under the workmen's compensation act and having been awarded compensation, was, therefore, barred from obtaining damages from the physician.

Revell contended, however, that the settlement with his employer could not have included his claim against the physician, citing in support of his contention Quinn *vs.* Railroad, 94 Tenn. 713, 30 S.W.R. 1036, in which it was held that an employer who has used reasonable care in the selection of a physician is not liable to his employee for injuries resulting from the negligence of that physician. That case, however, said the court, held that since the physician did not act under the direction and control of the employer, the physician could not be regarded as the employer's agent and that the employer was, therefore, not responsible for the physician's acts. If one is injured by the negligence of another and his injuries are aggravated by the negligence of a physician, the negligence of the original wrongdoer that made the services of the physician necessary is regarded as the proximate cause of the damage resulting from the physician's negligence. That is true even though the physician is selected by the injured person himself, provided the injured person exercises due care in making his choice. *Even*

if the plaintiff in this case had sued his employer at law, instead of proceeding under the workmen's compensation act, the employer would still have been liable for the result of the medical treatment.

The judgment of the trial court in favor of the physician-defendant was affirmed.[1] (Italics mine.)—*I. S. T.*

[1]Reprinted by permission from the *Journal of the American Medical Association.*

THE COMING ANNUAL MEETING

Time.—Monday, November 28, 1932, to Friday, December 2, 1932.

Place.—Atlantic City, New Jersey; Hotel Haddon Hall. Do not delay in writing for reservations.

Scientific Exhibit.—The plan is to display this in the ballroom on the second floor, where the illuminating boxes can be so spread out as to allow ample space between exhibits. Also, there will be space for chairs, so that it will be natural for groups to form for discussion of the exhibits while seated at their ease, rather than to have to stand in close proximity to the viewing boxes. The Scientific Exhibit naturally forms a nucleus for group discussion, and the officers have had in mind that space and comfort are factors in its success. Dr. J. T. Farrell, Jr., 235 South 15th Street, Philadelphia, is Chairman.

Commercial Exhibit.—This will be on the same floor as one of the excellent section meeting rooms, the thirteenth. This space is well adapted to its purpose, the Committee having had in mind the convenience of exhibitors and accessibility to visitors. Dr. A. L. L. Bell, 340 Henry Street, Brooklyn, N. Y., is in charge of arrangements.

Section Meeting Rooms.—One of these is on the thirteenth floor, near the Commercial Exhibit, while another is on the first floor. They are excellent rooms from every viewpoint.

Transportation.—If one hundred round-trip railroad tickets are validated, a rate of a fare and a half will be allowed, as in previous years. While plans are being perfected for a good attendance, it is not unlikely that many Eastern men will motor to Atlantic City, thus reducing the number of railroad tickets purchased. While this would seem to impose a hardship on those from a distance who will naturally come by rail, it is a logical consequence and one which it is quite useless to deplore. Of course, it is highly desirable that there shall be enough visitors to guarantee reduced rail rates, while those living nearby are enabled to avail themselves of a pleasant motor trip.

When purchasing your railroad tickets, therefore, if you come that way, ask for certificates as in the past, yet be canny enough to bring along enough money for full-fare return tickets in case so many of your associates motor to the meeting as to render this necessary.

Weather.—Visitors from a distance, who expect Atlantic gales to sweep Atlantic City's board walk, are respectfully referred by the officers to Dr. William G. Wescott, who is a resident of Atlantic City and "as convinced of its climatic perfection as are Californians of that of the West Coast."

Geographical Location.—Visitors will be within short rides of New York City, Philadelphia, Washington, and Baltimore, with their wealth of medical centers and institutions. A trip to the Atlantic City meeting may well embrace visits you have long wanted to make in the East.

Entertainment for Visiting Ladies.—A tea at the hotel is being arranged for the ladies. Since the Society has few members residing in Atlantic City, it has seemed only fair to keep the matter of entertainment rather simple. The location itself will assure opportunities for interesting trips and diversions.

EDITORIAL

HOSPITAL RADIOLOGIC DEPARTMENTS

The day is approaching when every hospital in the United States will have a well equipped radiologic department, conducted by a recognized radiologist. The rapid progress of radiology and its recognition by the medical profession as of the greatest importance in the diagnosis and treatment of disease will be the means, in time, of compelling all hospitals to be adequately equipped with modern X-ray apparatus and with sufficient radium to treat any case. The control of these agencies will be placed in the hands of a competent and experienced radiologist. It may even come to pass that it will be unlawful for any hospital to admit patients unless the hospital meets with certain requirements in regard to laboratory facilities. A physician is required by law to submit to examination by a medical examining board before he can practise his profession: thus the State protects its citizens from quacks and incompetent physicians. Why, then, should not these same citizens be protected by law against hospitals which disregard the welfare of their patients by not having the essential necessities for the practice of modern medicine?

We find, from a recent report by the American Medical Association, that roentgen-ray departments of hospitals are on the increase. "From 2,841 roentgen-ray departments in 1923 to 4,615 at the present time, or an increase of 62 per cent in eight years, is the record which hospitals have set. The State of New York, which reported 242 roentgen-ray departments eight years ago, now has 401. Large increases are registered in Florida, Kentucky, New Hampshire, Oklahoma, South Carolina, Utah, Vermont, and Virginia, each of which has a growth of 100 per cent or more over the number of roentgen-ray departments reported in 1923. Through the inspection of hospitals and correspondence with those which are not inspected, we are able to know that the hospitals which had not already made arrangements to have the roentgen-ray work supervised by competent physician-radiologists are rapidly establishing such service."

There are at present 1,998 hospitals in the United States without radiologic departments. It is inconceivable that such institutions, wholly devoted to the care of the sick, can be so derelict in their obligation to the public as to fail to provide adequate laboratory facilities. Without such provision, it is impossible for any hospital to operate effectively. In fact, it is just as incredible for a hospital to function efficiently without a radiologic department as for a physician to practise medicine without a stethoscope, thermometer, and blood-pressure apparatus. Yet there are physicians who do not hesitate to send their patients to such a hospital, depriving the helpless sick of a diagnostic and therapeutic aid to which they are entitled. It would appear that physicians are principally concerned with the presence of operating room facilities—nothing else seems to matter. It also happens

frequently that physicians refer patients to a hospital which has some X-ray apparatus, depending upon a lay technician to interpret the roentgen findings and to direct the application of radiation therapy. In certain instances, they make their own interpretations.

There seems to be a lack of understanding on the part of some physicians as to what constitutes a modern hospital's radiologic department. Their understanding is that somewhere in the hospital is a place in which photographs are made of their patients. There is supposed to be an X-ray photographic machine so simplified and so constructed that it is necessary only to push a switch and the "picture" comes out, so clear that little difficulty is experienced in making a diagnosis by almost anyone with slight experience. What a marvel! Apparently they fail to understand that the responsibility lies not in making the so-called "photograph" or "picture" but in its interpretation by a competent physician-roentgenologist.

We often hear of the business executive of a hospital inviting the medical and surgical staffs to inspect newly purchased X-ray apparatus. Someone expatiates on the grandeur and the great power of the apparatus, which is capable of making roentgenograms of "all parts of the body." The speaker is particularly solicitous in impressing the staff with the fact that the hospital has an X-ray laboratory, modern in every respect. Nothing is said perhaps as to whether or not this equipment is capable of handling the volume of work demanded by the hospital; nor is anything said as to the ability and experience of the one who is to operate this costly apparatus. In fact, the mere operating of the laboratory is ofttimes considered a trivial matter and for this reason but little consideration is given to it. In this regard, it is timely to warn hospital authorities of the care they should exercise in purchasing X-ray apparatus. Recently an eminent electrical engineer[1] said: "Manufacturers have at times been at fault when designing equipment in keeping in mind a low competitive sales price rather than the utility and safety of the product. This practice has been encouraged by some laymen hospital boards which purchase X-ray equipment on price basis only. This is due to their lack of intimate knowledge of uses and details of equipment, and of types of installation. Correction for this is suggested by giving the roentgenologist final approval on purchases made for hospital use."

In rural districts some ambitious but misguided physician assumes the rôle of surgeon, opens to the public a few rooms with perhaps some X-ray equipment, and calls this a hospital. It can be appreciated that under such circumstances it would be impossible to secure the services of an experienced radiologist to conduct this so-called radiologic laboratory. But, in such instances, the physician becomes his own radiologist. We do not subscribe to this sort of practice, which is bad, but perhaps under the circumstances, it may be permissible, particularly if the main use of the roentgen rays is in cases of fractures and dislocations. There can be no excuse, however, for any hospital in a large medical center, where it is always possible to procure the services of eminent radiologists as consultants, to continue to have inefficient, incompetent, and inexperienced physicians or lay technicians assume the responsibility of a radiologist. It is time for the radiological societies to manifest a greater interest in this regard. That this subject is of vital interest to all of us is shown by resolutions passed at the last meeting of the Radiological Section of the Southern Medical Association in regard to investigating the present hospital situation. The subject is brought up for discus-

[1] W. S. Werner: X-ray Protection from the Manufacturer's Viewpoint. RADIOLOGY, July, 1932, XIX, 5, 6.

sion at nearly every annual meeting of our Society, yet nothing has been done about it.

The American Medical Association is deserving of much credit and praise for its efforts to standardize radiologic departments in hospitals. They were among the first to recognize radiology as of sufficient importance to a hospital to warrant the setting down of definite regulations concerning radiologic departments. The Association will not register any hospital which fails to comply with the following regulation:

"The hospital should provide or have ready access to radiologic equipment and service. When a full-time or part-time physician-roentgenologist cannot be employed, the services of such a consultant should be procured. Radiologic interpretations must be made only by a competent roentgenologist. A description of the roentgenologic examinations should be placed in the patient's chart. The physician-roentgenologist preferably should be one listed by the Council on Medical Education and Hospitals of the American Medical Association."

We are not unappreciative of the great work of the American Medical Association in standardizing radiology in hospitals, yet we cannot help feeling that greater good would be accomplished if representative radiologists were invited by the Association to participate in hospital inspection. They might well be permitted to offer suggestions, based on their years of experience, in the choice of equipment for the radiologic department and also as to the ability and experience of the radiologist placed in charge.

It is reported that the radiologic departments of some of our state, county, and city hospitals are being severely abused. Many of the increasing numbers of patients now being admitted in these institutions are capable of paying private fees. On account of the laxity prevailing, there results an influx of free patients. In fact, there has been an increase in these various kinds of hospitals with a large additional bed capacity, during the last few years. This is demonstrated in a report recently published by the American Medical Association based on its investigation into the present hospital situation in the United States.

The American Medical Association reports that in 1932 there were 6,613 hospitals with 974,115 beds. Of this number, 576 were state hospitals; 508, county, and 77, city and county, a total of 1,525 hospitals under the control of state, county, and city governments. In 1927 there were 1,508 such hospitals, 17 less than at the present report of the American Medical Association. In 1927, these 1,508 hospitals had 484,725 beds, and in 1931, this number had increased to 572,354, an increase in four years of 87,629 beds. This large increase in hospital beds during the short period of four years is deserving of serious consideration and in a large measure accounts for the presence of "Old Man Depression" among the ranks of the medical profession. It is reasonable to believe that nearly all the patients occupying beds in these institutions are regarded as free patients, because these institutions are maintained by state and local governments. We are unable to find at this time how many of these 1,525 hospitals have radiologic departments, but, because they are maintained by public funds we may assume that nearly all of them have such departments and many free roentgen-ray examinations and radium treatments are made.

The large number of charity patients admitted to hospitals supported by the public can in part be attributed to the depression, but in a measure this increase is the result of the desire on the part of the public to obtain anything that is free. In one of these hospitals, there has been an increase of 42 per cent in the charity patients treated during the last three years. In times such as these, people are panic-stricken and become

hysterical, and when sickness overtakes them they immediately apply to free institutions. Too often those admitted as free patients are well able to pay for private medical and radiologic services, and are permitted to occupy beds and receive free roentgen-ray examinations and radium treatments and other hospital facilities which rightfully belong only to poor and indigent patients. Also, physicians have been known to send their private patients for free roentgen-ray examinations and radium treatments in these government-controlled hospitals. In such instances, it must be appreciated that the physician cannot be accused of being derelict in collecting his fee. In certain localities it is reported that compensation insurance companies send many of their cases to these institutions, where a nominal charge is made for services rendered. These abuses should cease. Not only is it unfair to the medical profession, but also to the taxpayers, who are made to carry the burden of expenses in maintaining these government-controlled hospitals.

THE CANCER PROBLEM

We are in receipt of a lengthy communication from Dr. Joseph Colt Bloodgood, noted cancer authority, in regard to the present cancer situation. It is to be recalled that Dr. Bloodgood has recently returned from a European lecture tour. His visit to Europe was by invitation of some of the leading cancer authorities there, to present the newer developments and conceptions in the diagnosis and treatment of cancer from the American viewpoint. Dr. Bloodgood's extensive experience in cancer work, and his profound knowledge of this subject, no doubt were the reasons for his being selected by the European physicians to discuss with them the present cancer situation.

RADIOLOGY expresses its regret in not having sufficient space to publish in full Dr. Bloodgood's recent contribution in regard to the chief controllable factor in cancer to-day. The article contains so much valuable and pertinent information for all of us that we will present a few paragraphs in order that our readers may appreciate the tremendous importance of this contribution.

"I have personally studied thousands of histories of patients who sought the advice of the medical profession after they had been warned for some time. The striking facts in these histories are: These patients, whose malignant disease can be diagnosed clinically, either have no family physician, even if they could afford it, or they have not had a recent diagnostic survey, and the chief cause of delay after they become aware of their symptoms has been ignorance rather than fear. From the very beginning of my contact with people suffering from cancer, forty years ago, I have been impressed that those who came early in those days had family physicians in whom they had confidence, and whom they consulted the moment they had any symptoms. The outstanding fact of the people operated on for cancer, whose histories are reported in the Surgical Pathological Laboratories of the Johns Hopkins University and Hospital, and who are alive and free from recurrence to-day, from ten to thirty years after operation, was that they all had a well trained family physician whom they consulted at intervals while they were well and always at once when they were not. From the very beginning of my studies of cancer of the oral cavity, the outstanding feature of the history was that the patient had not seen a physician for years, if at all. I am rather inclined to the opinion that the dental profession to-day could almost guarantee protection against cancer if their patients would submit to an oral examination as frequently as the dentists think necessary. In this way all irritation from teeth and plates would be eliminated. If the patient

used tobacco, the moment an irritated spot appeared, the dentist would recognize it in time and have the use of tobacco stopped.

"Up to 1900 in Halsted's clinic at Johns Hopkins, in the first hundred cases, the incidence of cancer was more than 80 per cent; benign tumors were less than 20 per cent. Among the 80 per cent more than one-half were inoperable. Among the operable cases the chances of a five-year cure were less than 20 per cent, of ten-year cures less than 10 per cent. Until 1900, no woman came for examination of the breast without a definite tumor for which operation was performed. In my clinic to-day the incidence of cancer is less than 10 per cent; the group of benign lesions for which operation is not indicated has now reached almost 80 per cent. The majority of these thousand women whose breasts were examined in the course of a physical examination, or because they had had recent warning symptoms, are mothers, and there should be a pelvic examination, especially an inspection of the cervix, by a good light. The skin should be surveyed for definite lesions. The mouth, nasopharynx, and nose should be looked at, and there should be a rapid diagnostic survey with a few laboratory studies. Should the general practitioner educate himself and prepare a proper examining room in his office for these diagnostic surveys, and the health departments, in co-operation with the local county, city, or state medical societies, educate and influence the public to seek these examinations, the average physician would have more to do than when there was no health department and no preventive medicine. It is to be borne in mind that these periodic physical examinations and diagnostic surveys are not for cancer only, but the threat, the scourge, the possibility of cancer as a disease of neglect, allows the medical profession and the health departments to employ it in influencing the public in regard to the necessity of selecting a clinic, or physician, or hospital while one is well and submitting to a periodic examination at proper intervals, and a diagnostic survey the moment one is warned. . . .

"We know that fully developed cancer, even with involved neighboring glands, has remained well twenty or more years after a proper complete operation. This is true of cancer of the skin, lip, and oral cavity, larynx, breast, stomach, colon, and rectum; malignant tumors of bones and soft parts. This group includes the most accessible to surgery. To-day there are twenty-year cases of cancer after the employment of roentgen rays and radium. Hence the control of cancer is no longer an experiment. All the various activities of which the world has been kept pretty well informed have passed the experimental stage. Of course, there is much still to be done in clinical research, especially in relation to deep roentgen-ray therapy and the amount and method of radium treatment for early cases of cancer of the cervix, skin, and oral cavity. There is still hope that, by increasing the amount of radium in the form of a bomb to 15 gm. and increasing the strength of the deep roentgen-ray machine, we may accomplish a certain percentage of successes in what are not uniform failures, that is, late cases of cancer, metastatic carcinoma, and localized early inaccessible cancer, such as in the esophagus, lung, and liver, and the early stages of cancer of the prostate, of which there is a very large number of cases. There is remaining the most important effort to be carried forward in pure research into the cause of cancer and the specific and preventive treatment of the disease. . . .

"Even if every individual submits to an annual diagnostic survey, complete protection is not achieved until the individual is informed and influenced to seek the advice, the moment he has any warning symptoms, of the nearest clinic if he is near one or the

physician who made the last physical examination."[1]

The subject of cancer is one that is always considered important. We are constantly benefiting by the experience of others, through a clearer understanding of this subject, until, at present, the disease is more amenable to treatment than ever before. It must be appreciated, as Dr. Bloodgood so correctly stated, that the early recognition of the disease cancer is the most effective factor in successfully treating it. We must, therefore, become more interested in cancer education, which will do more in focusing the attention of the laity upon the need for periodic examinations than anything we know.

[1]New Orleans Med. and Surg. Jour., August, 1932, LXXXV, 134.

ANNOUNCEMENTS

SOUTH CAROLINA X-RAY SOCIETY

On June 9, 1932, at a meeting held in the Medical Building, Columbia, South Carolina, the roentgenologists of the State of South Carolina formed the South Carolina X-ray Society.

The following physicians were made charter members: F. D. Rogers, M.D., of Columbia; R. B. Taft, M.D., of Charleston; P. D. Hay, M.D., of Florence; O. D. Baxter, M.D., of Sumter; Hillyer Rudisill, M.D., of Charleston; W. S. Judy, M.D., of Greenville; T. A. Pitts, M.D., of Columbia; W. M. Sheridan, M.D., of Spartanburg; F. R. Wrenn, M.D., of Anderson, and M. Mosteller, M.D., of Columbia.

F. D. Rogers, M.D., of Columbia, was elected President and Robert B. Taft, M.D., of Charleston, Secretary.

Meetings will be held at the time and place of the South Carolina State Medical Association meeting. The next one will be in Spartanburg in April, 1933.

THE COMING ANNUAL MEETING

ONE-WAY FARES AND PULLMAN CHARGES TO ATLANTIC CITY

From	Fare	Pullman[1]
Albany, N. Y.	$ 10.06	$ 3.00 (to New York)
		1.13[2] (to New York)
Atlanta, Ga.	29.93	8.63[3]
Boston, Mass.	13.19	2.63[2]
Buffalo, N. Y.	17.04	4.50
Chicago, Ill.	31.52	9.00
Cleveland, O.	19.37	5.63
Dallas, Texas	57.38	17.25[3]
Denver, Colo.	68.80	19.13[3]
El Paso, Texas	80.68	23.63[3]
Houston, Texas	60.78	17.25[3]
Kansas City, Mo.	46.92	12.75[3]
Los Angeles, Cal.	108.59	31.50[3]
New Orleans, La.	47.16	13.50[3]
New York, N. Y.	4.93	1.13[2]
Omaha, Nebr.	49.45	12.75[3]
Philadelphia, Pa.	2.06	.50[2]
Pittsburgh, Pa.	14.64	4.50
Portland, Ore.	108.73	31.50[3]
St. Louis, Mo.	36.88	10.88
St. Paul, Minn.	45.79	12.00[3]
Salt Lake City, Utah	86.59	23.63[3]
San Francisco, Cal.	108.59	31.50[3]
Seattle, Wash.	108.73	31.50[3]
Tampa, Fla.	42.97	12.75[3]
Washington, D. C.	7.32	3.75
		1.50[2]

Bear in mind that these are one-way fares. If one hundred railroad tickets are validated, all will be able to avail themselves of the half-fare return trip. In buying

[1]Pullman charges are for lower berth and include surcharge.

[2]Seat charge.

[3]Through Pullman charge to Philadelphia. Seat charge from there to Atlantic City, 50 cents additional.

tickets, secure a certificate—it may save you a tidy sum on the way home.

The above tabulation of railroad fares and Pullman charges has been prepared under the supervision of A. L. L. Bell, M.D., of Brooklyn, N. Y., Chairman of Transportation for the Society. It may prove of interest to those who are preparing to go to the Atlantic City meeting.

"A CENTURY OF PROGESS" EXHIBIT

The Mallinckrodt Chemical Works, of St. Louis, in addition to a commercial display, is sponsoring an exhibit in the electrochemical section of the chemistry division at the Century of Progress, Chicago, in 1933. This exhibit, which has already been constructed, shows the growth and development of metallic crystals of lead, tin, and cadmium. It is now in the Basic Science laboratory in the Administration Building, pending its removal to the Great Hall of Science, where it will be on permanent display during the exposition. The Hall of Science was recently completed and dedicated, but, as yet, none of the permanent displays have been removed to it. The Administration Building, where the Mallinckrodt exhibition is at present situated, is open to the public and visitors are cordially invited to inspect the various displays.

BOOK REVIEWS

DER OPERIERTE MAGEN. By PROF. DR. HERMANN MEYER-BURGDORFF and DR. WALTER SCHMIDT, Göttingen. A volume of 114 pages and 146 illustrations. Published by Georg Thieme, Leipzig, Germany, 1930. Price, 9.60 marks.

This study of the roentgenologic appearance of the post-operative stomach which previously appeared as a chapter in "Ergebnisse der Medizinischen Strahlenforschung," Vol. IV, has been reprinted in monograph form. It is a comprehensive treatise of a phase of gastro-intestinal roentgenology which offers many perplexing problems for the roentgenologist. The author first discusses the physiologic changes resulting from operations on the stomach, and the roentgenologic technic for examining the post-operative stomach. In Chapter IV the roentgenologic features of the various types of gastric operations are discussed in detail, as follows: *(a)* Gastrotomy, local incision, closure of perforations and gastroplastics; *(b)* Gastrostomy and gastro-gastrostomy; *(c)* Stomach and bowel anastomoses (1) gastrojejunostomy, (2) gastroduodenostomy, (3) duodenojejunostomy; *(d)* Alteration of pyloric function (1) pyloroplasty, (2) pyloric occlusion by Eiselberg's method; *(e)* Gastric resections (1) sleeve resection, (2) Billroth No. 1, (3) Billroth No. 2, (4) subtotal and total resection, stomach and colon resection; *(f)* Gastropexy. In Chapter V the following post-operative complications are considered: *(a)* Operative and mechanical conditions (1) peritonitis, (2) subphrenic abscess, (3) adhesions, (4) abdominal hernia, (5) internal hernia; *(b)* Spastic and atonic complications; *(c)* Late complications (1) non-healing ulcerations, (2) gastrojejunal ulcer and gastrocolic fistula.

This book should be of great interest to all roentgenologists and gastro-enterologists for it contains much information that is pertinent to a very important subject. The text is fully illustrated by 146 excellent roentgenograms and drawings.

EINE METHODE ZUR MESSUNG VON RÖNTGEN-, RADIUM-, UND ULTRASTRAHLUNG NEBST EINIGE UNTERSUCHUNGEN ÜBER DIE ANWENDBARKEIT DERSELBEN IN DER PHYSIK UND DER MEDIZIN. Mitt einem Anhang enthaltend einige Formeln und Tabellen für die Berechnung der Intensitätsverteilung bei gamma-Strahlungsquellen. By ROLF M. SIEVERT, from the Physical Laboratory of the Radiumhemmet, Stockholm. Supple-

ment 14 to *Acta Radiologica*, paper, 179 pages, with 142 tables and 171 figures in the text followed by 22 pages of formulas and tables and 8 pages of reproductions of photographs. F. Englunds Boktryckeri A. B., Stockholm, 1932. Price, 20 Swedish crowns.

In this monograph Sievert first goes into a thorough discussion of the mathematics and physics of ionization measuring devices. From these considerations he favors condenser-chamber systems, the advantages and disadvantages of which are analyzed. He has developed many condenser-chamber measuring devices which are suitable not only for measuring the various types of X-rays, but also gamma rays, so that the technical factors used in radiotherapeutic technics can be checked up not only at the Radiumhemmet, but also can be compared with those factors used in clinics elsewhere. Sievert then describes and illustrates some condenser-chamber devices which he has used for measuring not only surface doses but those in the body cavities. By the use of these ingenious chambers it is easy to measure the "dose" on the side of the neck opposite to that on which the radiation is incident. The peculiarities of the physics and the construction of these chambers is considered from a point of view understandable by any one who has studied high-school mathematics and physics.

The monograph has a bibliography of 171 references to ionization studies, then photographs of the measuring devices and their accessories, and closes with tables of the energy distribution of gamma radiation.

The reviewer hopes this book will shortly appear in English as it is the best on the subject of which he personally has knowledge.

E. T. Leddy, M.D.

A Study of the Ionization Method for Measuring the Intensity and Absorption of Roentgen Rays and of the Efficiency of Different Filters Used in Therapy. By Robert Thoraeus, from the Physical Laboratory of the Radiumhemmet, Stockholm. Supplement 15 to *Acta Radiologica*. Paper, 88 pages with 40 figures and 23 tables in the text. F. Englunds Boktrycker, Stockholm, 1932. Price, 10 Swedish crowns.

In this monograph Thoraeus reports some measurements he carried out at the Radiumhemmet with a constant potential roentgen machine by means of a standard and a portable ionization apparatus. Five qualities of radiation were used: *(a)* 1 mm. aluminum and 100 K.V. const.; *(b)* 2 mm. aluminum and 100 K.V. const.; *(c)* 4 mm. aluminum and 140-150 K.V. const.; *(d)* 0.5 copper + 1 mm. aluminum and 165-175 K.V. const.; *(e)* combined tin filter and 165-175 K.V. constant. With these set-ups the filtering properties of different metals were studied and are given in numerous charts and tables. The efficiency of various metals as filters is discussed and data are given by which the best filter may be selected. The author describes a new tin filter to take the place of 2 or 3 mm. copper to produce hard radiation, and points out its advantages.

The monograph closes with some studies made in the water phantom on the relative rôles of true absorption and back-scattering.

This little book is to be recommended as a masterful contribution toward solving the puzzling problems of filtration and dosage in roentgentherapy.

E. T. Leddy, M.D.

Biologie des Radium und der Radioaktiven Elemente. By Julius Stoklasa, Ph. Dr., Dr. Ing. H. C. Dipl, Ing. Agr., Professor der Tschechischen Hochschule, Direktor der Staatlichen Versuchsstationen und Mitglied des Wissenschaftlichen Kuratoriums des Staatlichen Radiologischen Instituts in Prag, and Josef Penkava, Dr. Ing. Sektionsrat und Wissenschaftlicher Mitarbeiter des Staatlichen Radiologischen Instituts in Prag. Volume I. Biologie des Radiums und Uraniums. Cloth, 958 pages, with 152 figures in the text, 1 colored plate, and 4 tables. Published by the support of the Tschechoslowakischen Ministeriums für Schfulwesen und Volkskultur. Verlagen von Paul Parey, Berlin, 1932. Price, 74 Reichsmarks.

Stoklasa, the first president of the International Congress of radiologists and roentgenologists, held in Prague in 1912, has summed up in this book his twenty-five years' experience in the biology of the radio-active elements for all whose work lies in this field. The book will appear in two volumes; in the first there is discussed the radio-activity of the earth's atmosphere and earth's gases (pages 1–74), the lithosphere (pp. 75–138), the hydrosphere (pp. 139–174), the taking up of radio-active inductions by plants and animals (pp. 175–182), the historical development of research on the effect of radio-activity on micro-organisms, plants, and animals (pp. 183–198), the effect of the various radio-active elements on the metabolism of plants (pp. 199-214), the effect of the various radio-active elements on the animal and human bodies (pp. 215–253), the biology of uranium (pp. 254–319), the biology of the ionium-radium family (pp. 320–461), the chemistry of the sugars in the living plant cells and the effect of radio-activity on the anaërobic gas exchanges in the plant organism (pp. 462–508), cell respiration (pp. 509–539), the dynamics and the energy exchanges in the assimilation of carbonic acid (pp. 540–586), the assimilation of carbon dioxid as effected by radio-activity in the course of the vegetative development of chlorophyllic cells (pp. 586–617), the utilization of light in photosynthesis and its formative effect on the growth and reproduction of cells (pp. 618–639), the effect of radio-activity on the animal organism (pp. 640–645), the radiophysiology of animal cells (pp. 646–767), the physiology of metabolism (pp. 768–784), the effect of alpha, beta, and gamma radiation on the anaërobic respiration of animal organs (pp. 785–801), some experiments on the chemistry of anaërobic metabolism in the animal body under the effect of alpha, beta, and gamma radiation from radium (pp. 802–874), the effect of alpha, beta, and gamma radiation on the aërobic respiration of the animal organism (pp. 875–887), the effect of beta and gamma radiation on the growth of young animal structures (pp. 888–900), and concluding remarks (pp. 901–911). A voluminous bibliography follows each chapter. An extensive index (pp. 912–957) closes the volume.

Even though this book is of little practical value to radiotherapists, its inclusion in their libraries is well worth while because it is a storehouse of information about material that may be capable of adaptation into clinical treatment and because it will give them a knowledge of the purely scientific basis on which radiotherapy rests. For biologists and researchers in the fields of physiology and of radio-activity, this work will be a welcome reference book.

E. T. Leddy, M.D.

Verlauf der Wichtigsten Knochen- und Gelenkerkrankungen im Röntgenbilde. Eine anschauliche Prognostik. By Privatdozent Dr. med. Victor Hoffmann, Oberarzt der Chirurgischen Universitätsklinik im Augusta-Hospital zu Köln. With a German and English text. A volume of 264 pages and 585 illustrations. Published by Julius Springer, Berlin, 1931. Price, 69.80 reichmarks.

In presenting this volume the author has carried out an idea and fulfilled a purpose that subsequent authors of roentgenologic texts might well emulate. Hoffmann has concerned himself not only with the diagnosis but the subsequent progress of the various conditions that he presents. The latter phase of roentgenologic diagnosis has been much neglected. The majority of us concern ourselves with the original diagnosis, which is important, to be sure, but too few are familiar with the subsequent stages and end-results of disease. As the author states, the object of the book is to demonstrate the most important bone and joint diseases and their subsequent course. The various stages which are shown belong to one and the same case and are not the different stages of a disease in different patients. In this way the entire course is accurately presented in a way that is rarely possible to see in daily life except in a large clinic.

Chapter I concerns acute inflammation of bones and joints classified as *(a)* hematogenous, dental and traumatic osteomyelitis, and *(b)* acute specific and non-specific joint inflammation. The series of roentgenograms used to depict these various conditions are well chosen and extremely instructive. Chapter II is devoted to the chronic specific inflammations, tuberculosis, and hereditary and acquired syphilis of bones and joints. The various types of tuberculous bone infection are illustrated most excellently. Chapter III is devoted to a presentation of the primary and secondary bone tumors and the progressive course of these lesions is well depicted. In Chapter IV there is a discussion of disturbances of growth, classified as *(a)* primary growth interception, *(b)* secondary growth interception, *(c)* localized circulatory and growth disturbances, and *(d)* metabolic disturbances. Chapter V concerns chronic nonspecific joint diseases considered as *(a)* chronic joint rheumatism, and *(b)* arthritic deformans and tabetic arthropathy. Chapter VI treats of the healing of fractures, pseudo-arthrosis, epiphyseal injury, and intracapsular fracture. A supplement to this chapter concerns myositis ossificans, traumatic bone atrophy, and ischemic muscle contracture. The concluding chapter deals with bone transplantation and joint formation under the divisions *(a)* independent auto- and hetero-transplantation, and *(b)* arthroplasty and nearthrosis.

This volume is more than a pictorial atlas, as there is an excellent summary of the significant clinical phenomena associated with each case, and an introductory paragraph for each subject which contains the pertinent facts concerning it. Those who cannot read German will be grateful for the coexisting English translation of the text which undoubtedly will enhance the value of this work in English-speaking countries. The publishers are to be complimented for the excellence of the illustrations, upon which the success of a volume of this sort depends.

COURTS AND DOCTORS. By LLOYD PAUL STRYKER. Fifth printing (in seven months); 236 pages, 12 mo, maroon buckram. Published by The Macmillan Company, New York, 1932. Price $2.00.

The author was for many years the general attorney for the Medical Society of the State of New York and during that period had personal charge of the legal affairs of that body.

The book is replete with concise, desirable, and authoritative information presented in a readable manner. Unlike most books on law, this one is not dry and tiresome, but may be opened at any page and something of interest and value found.

The arrangement under the headings of The Practice of Medicine, The Relationship of Patient and Physician, The Action for Malpractice, Defenses to Action for Malpractice, Expert Testimony, The Doctor on the Witness Stand, and The Doctor and Criminal Law is good and this is further improved by division into thirty chapters upon different medico-legal subjects. Leading cases (279) are cited and tabulated as references and also alphabetically listed.

This book shows that the writer knows doctors, and knowing doctors as he does, he is better able to intelligently advise them. It is valuable and should be in the hands of every physician who has been sued, is being sued, or is liable to be sued; has been on the witness stand or expects to be a witness; visits patients or has patients visit him.

I. S. TROSTLER, M.D.

HOTEL RATES FOR ANNUAL MEETING

The following rates are quoted by the Atlantic City Convention and Publicity Bureau, Inc., as applying to the Chalfonte and Haddon Hall Hotels:

	American Plan (With Meals)				European Plan (Without Meals)			
Single Rooms with Bath	$7	$8	$9	$10	$3	$4	$5	$6
Double Rooms with Bath	$12	$14	$16	$18	$5	$6	$7	$10
Single Rooms, Running Water	$5 (Chalfonte only)							
Double Rooms, Running Water	$9 (Chalfonte only)							

ABSTRACTS OF CURRENT LITERATURE

CONTENTS BY SUBJECT

THE FOLLOWING ABSTRACTORS HAVE CONTRIBUTED TO THIS ISSUE

J. N. Ané, M.D.
B. J. DeLaureal, M.D.
H. W. Hefke, M.D.
E. T. Leddy, M.D.
Davis H. Pardoll, M.D.
E. A. Pohle, M.D., Ph.D.
C. G. Sutherland, M.D.

CONTENTS OF ABSTRACTS IN THIS ISSUE, LISTED ALPHABETICALLY BY AUTHORS

TUMORS (THERAPY)

Radiosensitivity of Malignant Tumors of the Ovary. Lucien Mallet. Arch. d'Électricité Médicale, August-September, 1931, XXXIX, 289-300.

Radiotherapists and gynecologists agree that cancer of the ovary is often very radiosensitive and that radiation therapy should be employed in cases of incomplete surgical removal, recurrences after operation, or in the inoperable types of malignancy. Theoretically, this increased sensitivity conforms to the histologic structure of these tumors involving the genital glands, as demonstrated by Lacassagne. Practically, however, the results in the treatment of these tumors by radiation are very uncertain. Very often patients are referred to the radiotherapist with no information of any kind regarding the histologic structure or macroscopic appearance of the tumor at operation. In the absence of a microscopic examination of sections of the growth it is impossible to predict its sensitivity, and even when the histologic structure of the malignancy is known, the results of radiation therapy are hard to determine in advance, for considerable difference of opinion exists regarding the variations in sensitivity of the many types of ovarian tumors.

The author has studied the histologic structures of many forms of ovarian malignancies and the effects of radiotherapy upon these types. He classifies these growths as follows: Ovarian seminomas; endodermoid epitheliomas of Lecène; ovarian folliculomas; malignant papillary tumors; Wolffian epitheliomas; teratomas; spindle-cell sarcomas; lymphosarcoma; secondary carcinomas from the digestive tract, and other less common forms.

It was demonstrated that the seminomas and the folliculomas were very radiosensitive and that the sensitivity of the Wolffian epitheliomas was variable, depending upon the histologic structure. However, in this latter form radiotherapy was shown to be valuable for the prolongation of the life of the patient. The results obtained from this form of therapy in cases of papillary epitheliomas were not so favorable. It was found among the sarcomas that the radiosensitivity varied with the type of cell present, as the lymphosarcomas were very radiosensitive, while the spindle-cell sarcomas were more radioresistant.

It is the author's opinion that radiotherapy offers a valuable form of treatment in ovarian tumors if the case is carefully studied and treatment started as early as possible. A sufficient area should be covered by the rays to include the invaded areas as well as all possible lymphatic and peritoneal foci. The patients usually experienced no discomfort or pain as a result of the treatment, and in the author's experience bad results from anemia or absorption were rarely encountered. All new lymphatic foci were treated as soon as they were discovered. The author employs the following factors: Penetration, 200 K.V.; filtration, 1 mm. Cu plus 2 mm. Al; focal skin distance, 43 cm.; field, 16 × 16 centimeters. Seminomas, folliculomas, and lymphosarcomas were treated by maximum fractional doses of 500 r applied daily to each field. It was determined that in many cases 3,500 r to each field proved sufficient. More intensive treatment was administered to the papillary epitheliomas, Wolffian epitheliomas, teratomas, and spindle-cell sarcomas as from 1,000 to 1,500 r were given daily until each field received a total dose of from 4,500 to 5,000 r, on the surface.

Likewise, radium therapy produced favorable results which were found particularly valuable for pelvic application. The vaginal culdesac was irradiated by means of 10 mg. tubes of radium filtered by 2 mm. of platinum, and placed in an 8 mm. thick rubber colpostat. Depending upon the sensitivity of the tumor, applications lasted from eight to fifteen days. In the more resistant forms, such as the papillary epitheliomas, the surface application of radium in molds was employed.

J. N. Ané, M.D.

Rare Renal Tumors. Louis Clive Jacobs and Lawrence H. Hoffman. Jour. Urol., January, 1932, XXVII, 33-46.

In the renal region a palpable tumor of rapid growth, producing clinical symptoms, associated with cachexia, loss of weight, fever, etc., with an absence of urographic and urinary pathologic findings, is always suggestive of perirenal sarcoma. Radiography is apt to delineate a tumor mass, or the kidney shadow may have an indefinite outline.

Invasion of the retroperitoneal perirenal fossa by a tumor of the mixed-cell sarcoma type signifies the highest degree of malignancy.

Myxomas, while only locally recurrent, are equally grave as to prognosis.

The treatment of these conditions should be surgical and should consist of the complete removal of the kidney and tumor mass, including the adipose capsule. The perirenal fat should be dissected from the peritoneum and from the muscles of the posterior abdominal wall. The application of radium and deep X-ray therapy at the site of the nephrectomized area should be immediately instigated.

The prognosis is extremely grave, the expectancy of life being less than one year. Recurrences at the original site are common and are immediately followed by generalized metastasis.

Davis H. Pardoll, M.D.

Radiation Therapy of Brain Tumors. Antoine Béclère. Strahlentherapie, Dec. 12, 1931, XLII, 807-880.

The author, who treated, in 1909, one of the first hypophyseal tumors reported, reviews in this article his experience with radiation therapy in brain tumors. It might be interesting to note that the patient

treated in 1909, a girl of 16½ years, was cured by roentgenotherapy at that time. She married, gave birth to a normal child, and is now, 22 years later, in good health. The author discusses then the radiosensitivity of normal brain tissue and of the intracranial tumors, namely, tumors of the hypophysis and of the brain tissue proper, the possible mechanism of radiation therapy, and the general technic. His conclusions are so precise that they will be repeated here.

Roentgenotherapy as a curative procedure is indicated as soon as the first symptoms appear in adenoma of the hypophysis. Surgery should be considered only if there is a definite aggravation of the condition. Roentgenotherapy should be used as post-operative treatment method, both for palliation and prophylaxis if the tumor has been partially excised or can not be removed. Even after complete removal, radiation should be employed in order to prevent a recurrence. Roentgenotherapy is indicated as a symptomatic treatment method in cases in which the tumor cannot be exactly located but presents symptoms of intracranial pressure. It is not necessary to do a decompression before irradiation. If the symptoms are aggravated and trepanation becomes necessary, radiation therapy should be continued. Radiation therapy is also the only treatment method left if surgical intervention is contraindicated or refused by the patient.

ERNST A. POHLE, M.D., Ph.D.

ULCERS (ETIOLOGY)

The Dangers of Using Impure Mucin in Treatment of Peptic Ulcer. Andrew B. Rivers, Frances R. Vanzant, and Hiram E. Essex. Jour. Am. Med. Assn., April 2, 1932, XCVIII, 1156.

The authors have demonstrated in certain specimens of commercial mucin the presence of large amounts of a secretagogue which by biologic tests seems to be histamine. The presence of this substance may be looked on as a contaminant, which can be avoided if proper methods of preparation are used. Until a consistently standardized, pure product is supplied, it will be impossible to evaluate the therapeutic use of mucin.

C. G. SUTHERLAND, M.D.

Gastric Mucin in the Treatment of Peptic Ulcer. Arthur J. Atkinson. Jour. Am. Med. Assn., April 2, 1932, XCVIII, 1153-1156.

Clinical and experimental observations have indicated that a mechanical and a chemical factor are important in the healing of gastric ulcers and ulcers of the upper intestinal tract. Forty-three patients with history, signs, symptoms, laboratory evidence, and roentgen manifestations of peptic ulcer were treated with mucin. Remarkable results were obtained in patients who were previously having distress on dietary or alkali management. The author feels justified in believing mucin treatment is conducive to healing.

C. G. SUTHERLAND, M.D.

The Remote Results of Gastro-duodenal Ulcers Treated with Parathyroid Extract. Max M. Lévy and Erna Lévy. Arch. d. mal. de l'app. digestif, October, 1931, XXI, 916-936.

Parathyroid extract has given no definite cure. The authors report four cases which gave absolutely negative results and four which were partially successful. Three cases presented niches, one of which completely disappeared, but the pain continued and resort was had to surgical intervention. Another showed partial disappearance of the niche, which did not alter the course of the disease. The niche in the third case did not disappear.

No other treatment or modification of diet was allowed, except the routine use of the extract (Collip) of the fresh gland, given subcutaneously every day or two in a series of 12 injections. There occured a lowering (from 26 to 86 per cent free HCl and from 6 to 75 per cent of total acidity) of the free and total acidity of the gastric juice. The pain disappeared following the second or fourth injection, vomiting ceased, and the patient gained weight. However, there is no influence on the recurrence of the symptom complex. Only a minute rise in blood calcium could be noted.

This method may be of value as a pre-operative treatment, allowing a patient to become a better surgical risk. Due to its rapid results it can be used as a successful therapeutic adjunct, even though there is no definite healing of the ulcers, but only a distinct improvement of symptoms.

B. J. DELAUREAL, M.D.

The Clinical Symptoms and Radiologic Signs of Duodenal Ulcer. H. Annes Dias and Pedro Maciel. Rev. Radiol. Clinica, February, 1932, I, 143-158.

The clinical investigation makes the diagnosis presumptive; the X-ray examination makes the diagnosis certain and definite. The patient should undergo a complete examination in order that a definite opinion about the activity of the organ may be formed, as well as the relationships of lesions in other organs to the development of the duodenal ulcer. Clinically the ulcer is characterized by an increasing frequency of pain after eating. If the intervals between the taking of food and the onset of pain are becoming longer, the assumption may be made that the ulcer is healing, but there is always present a *locus minoris resistentiæ* which may cause trouble at any time. Hunger-pain and early morning pain are two different phenomena. The latter is of great diagnostic importance and does not depend on the emptiness of the stomach but on the status of

the vegetative nervous system. Early morning pain occurs at the time of the spasmodic phenomena (asthma, Miller's asthma, etc.) when as a result of hypertonus of the vagus an excessive secretion of the stomach and a hyperactivity are produced.

One should never forget the possibility of gastroduodenitis which may resemble duodenal ulcer clinically and cause confusion in the diagnosis. In duodenitis there is a superficial lesion in the mucous membrane, but, the *muscularis mucosæ* is intact. In ulcer the lesion involves this layer. Direct signs are of greatest importance in diagnosing duodenal ulcer. A careful technic will, in most cases, demonstrate the niche. In duodenitis there is no niche but there are spasmodic deformities of the mucosa and marked deviations from its normal appearance, as shown by relief studies. Persisting deformities of the duodenal bulb, with the absence of a niche, suggest old lesions complicated by sclerotic retraction of the wall and periduodenitis.

E. T. Leddy, M.D.

ULTRA-VIOLET LIGHT

Influence of Ultra-violet Light on the Glucose Tolerance of Rabbits. R. W. Root. Arch. Phys. Ther., X-ray, Radium, 1931, XII, 153-156.

Rabbits on a normal diet were fasted for 18 hours and then given 3 gm. glucose per kg. body weight by means of a stomach tube. Ultra-violet light administered immediately apparently increased the tolerance for high concentrations of glucose.

Chemical Abstracts.

Studies of the Dosage Problem of Ultra-violet Light. Part II.—How Far can Measuring Methods for the Determination of the Erythema Effect be Used for the Study of Other Biologic Effects of Radiation? R. du Mesnil de Rochemont and Heinz Kirchhoff. Strahlentherapie, Jan. 9, 1932, XLIII, 170-187.

The authors have continued their studies dealing with dosage problems of ultra-violet light. They state that for light biologic investigations with different wave lengths of ultra-violet rays separate intensity measurements for the various spectral ranges have to be carried out. The measurements can, for instance, be done with methods offering a selective sensitivity. The sensitivity curve of the measuring reaction must run parallel to that of the biologic object. Artificial sources of light, the spectral intensity distribution of which does not change much, can be calibrated with one single method which is sensitive to a broad spectral band.

The suggestion is made to use the effect of a certain dose of radiation of known spectral intensity distribution as a unit. The ultra-violet unit "Höhensonneneinheit" (HSE) has been used by the authors. This unit is well defined by a definite photochemical reaction, the so-called Bering-Meyer iodine test. While this reaction was originally based on the spectrum of the quartz mercury vapor lamp, a comparison was carried out with the iodine test on the so-called Kandem arc light. The biologic reactions used for the experiments were the hemolysis of red blood corpuscles and the bactericidal effect on *Staphylococcus aureus*. It appeared that the erythema ratio of the quartz mercury vapor lamp and the Kandem arc light was the same as that of their spectral ranges possessing the hemolytic and bactericidal action. The same relation is found when using the cadmium cell. A different ratio is obtained, however, by means of the iodine test. In order to find, by means of the iodine test, on the Kandem lamp, the time for a dose which is equivalent to the ultra-violet unit in its erythema, hemolytic and bactericidal effect, it is necessary to multiply the time obtained by the iodine test on that lamp with the factor 0.58. It appeared that hemolytic changes in blood agar plates took place after application of from 2 to 8 ultra-violet units. A slight inhibition of the growth of staphylococci could be noted following exposure to 1/23 ultra-violet unit. The growth ceased after the application of ⅓ ultra-violet unit.

Ernst A. Pohle, M.D., Ph.D.

VENEREAL DISEASE

Roentgenotherapy of Gonorrheal Disease of the Male Adnexa. Konrad Neuschloss-Knüsli. Röntgenpraxis, Dec. 1, 1931, III, 1101, 1102.

Wetterer has reported the good results of roentgenotherapy in gonorrheal diseases of the male and female. He irradiated arthritis, adenitis, prostatitis, spermatocystitis, epididymitis, urethritis, and cervicitis. In males a chronic gonorrhea of the prostate and seminal vesicles is rather often very troublesome, neither massage nor diathermy seeming to help. Radiation therapy at the right time would have shortened the duration markedly in many cases. Epididymitis is also best treated by roentgen rays, in the author's experience. About one-half S.E.D. is applied to the prostate through two fields (anterior and posterior). A few cases are described.

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